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August 1988

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The RAINBOW

THE COLOR COMPUTER MONTHLY MAGAZINE

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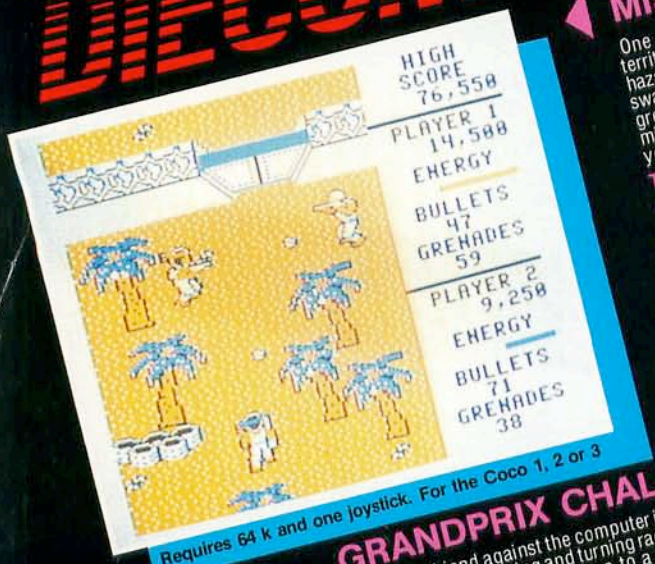

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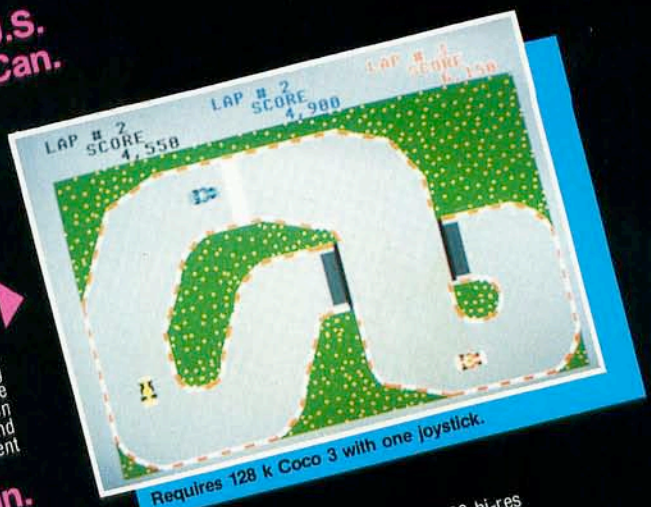

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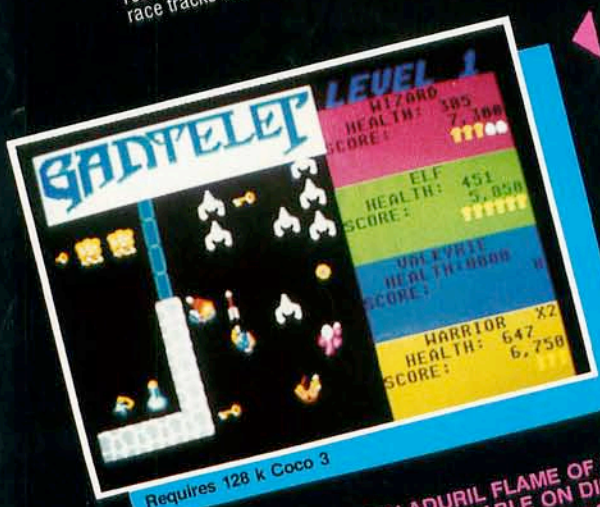

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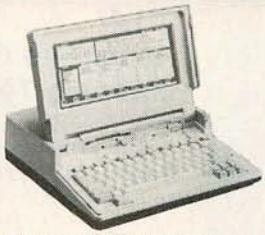

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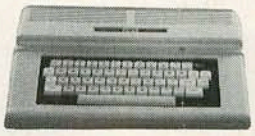

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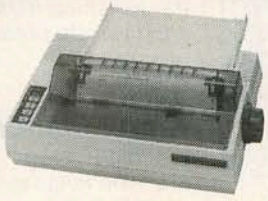

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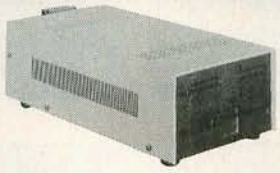

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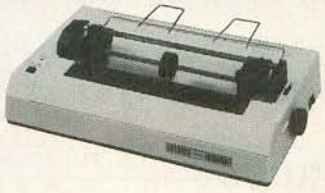

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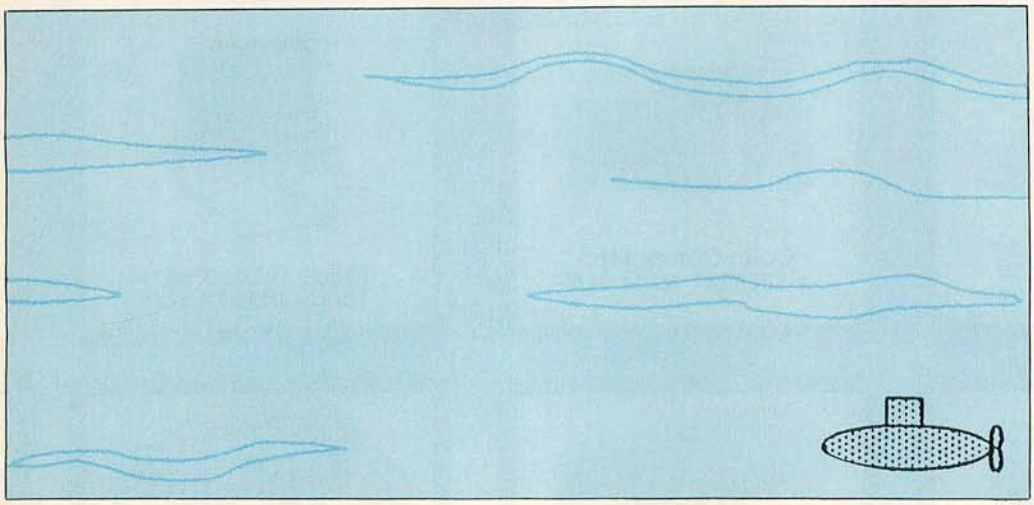

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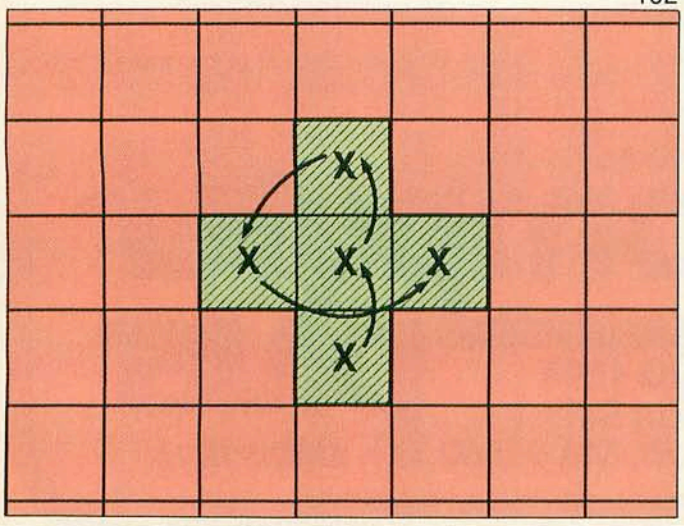

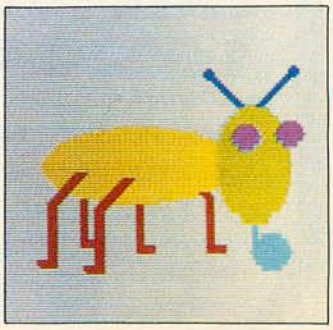

Novices Niche

The cassette tape/disk symbols beside features and columns indicate that the program listings with those articles are on this month's RAINBOW ON TAPE and RAINBOW ON DISK. Those with only the disk symbol are not available on RAINBOW ON TAPE. For details, check the RAINBOW ON TAPE and RAINBOW ON DISK ad on Page 52.

Columns

Rainbowtech

Product Reviews

Departments

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For RAINBOW Advertising and Marketing Office Information, see Page 192

Letters to the RAINBOW

BACK TALK

Editor:

I read the "Building May's Rainbow" column, and I'm surely glad to hear that there are plans to diversify the magazine instead of sticking so rigidly to the monthly theme. The magazine has become quite predictable because of the theme format.

I'm also glad to hear that you plan to publish a cross-reference to the various printers, showing the different printer codes and what they do. There are some great programs in this year's Printer issue, but I'm not able to utilize many of them. I use an Epson printer, and many of the Tandy DMP printer codes are quite different from the Epson's. I'm sure there are many CoCoists who use different printers on the market. By the time the next Printer issue comes around, let's hope that there will be some kind of cross-reference so we can use the programs in that issue.

Val Burke
Red Oak, GA

There's no need to wait for our next Printer issue, Val. See Cray Augsburg's "Printer Diversions and Conversions" beginning on Page 142 of this issue.

A Different Prescription

Editor:

There were a couple of questions and answers in the May '88 "Dr. ASCII" column that I would like to comment on.

First of all, the "Dr. ASCII" column is worth its weight in hard disks, and both answers were correct. I'd simply like to provide alternate solutions to the reader's questions. (Besides, it gave me another good excuse to use Delphi.)

In the first question, titled "If You Fall Into an Error Trap," Mr. Lute states that on his CoCo 3, an FC Error comes up as error number -1, instead of error number 4, as the manual states. His problem just might be that he is trying to get the Error Number (ERNO) value from the direct mode (that's when the CoCo is waiting for you to insert or edit lines, etc.). When the CoCo 3 enters the direct mode, it resets the value of ERNO to -1. So no matter what the actual error number was, the result would always be -1.

To solve the problem, you might insert a statement like: `ER=ERNO:EL=ERLIN` into your error trap routine. Then when the program halts because of an error, you can type: `PRINT ER,EL` and get correct results.

In the second question, titled "High Poking Disk BASIC 1.1," Mr. Bradley wants to know why his disk gets trashed in the double speed mode, while some other people use it all of the time with no troubles at all. The Dr. says it's probably caused by an old 12-volt disk controller.

It might also be caused by the drive itself. Disk BASIC uses a series of fixed time delays when accessing the disk drive. The one that causes the most trouble when using the double speed mode is the track-to-track step rate.

If you're using drives with a 30-ms step rate, which is standard for the older drives (and Disk BASIC), and you try using the double speed mode, you're pushing the drive past its speed limit because the 30-ms time delay is converted to 15-ms when using the double speed mode. The person that is having no trouble in high speed might be using drives that can handle 15-ms — or faster — step rates.

Ken F. Halter
Chino, CA

REVIEWING REVIEWS

Editor:

I wish to comment on both the product, *Telewriter-128*, and the review of it in the May '88 issue.

The excellent review caused me to buy the product, which is superb. Indeed, the review seriously understates the excellence of this latest *Telewriter*. However, I would like to provide one or two suggestions and minor criticisms that may save other readers time when they install *TW-128*; I'll cover those first.

Older versions of *Telewriter* were sometimes DOS-sensitive; they would run fine under Disk BASIC, but misbehave under the more advanced optional DOSs some of us use. The review should have stated that *TW-128* is more widely compatible; I am running it primarily on ADOS-3, but I have run it on four other DOSs, only one of which was Disk BASIC. There was one minor glitch — the `CONVRT64` auxiliary program (for transferring old *TW-64* `.BIN` files to *TW-128* `.TXT` format) is DOS-sensitive in Line 450. If it hangs on, you go to a different DOS. That auxiliary program is only used occasionally, so this is not a significant glitch. However, the entire documentation to `CONVRT64` is inside the program just after it hangs, which leads me to a frustrating hour or so!

Nowhere in the documentation does it state whether this version is compatible with a RAM disk. Earlier ones were not, so it would be nice to know. However, so far none of my files have been big enough to try my RAM disk; and with a 48K buffer, few users will need one.

There should be some way to dump the eight screens of help listings to hard copy. CTRL-H is fast, easy, well-written and convenient. But I want to screen dump it for my file folder and haven't been able to so far. How does one do that?

The review fails to mention one vital point: The macros allow recursive use! It's not even mentioned in the manual. Why is that important? It took me six macros to define all the non-printing junk with which I frequently preface my documents — tab settings, embedded control codes, formatting instructions, and a short, non-printing description of each of these. Because each macro can be included in other macros, I was able to define a series of single-stroke macros to provide all the non-printing stuff plus my home or business letterhead. On earlier versions, I kept a series of dummy files to read in and append to for this purpose. Now, instead of four or five such files, I have one systems file, `TW*DEFS`, which sets up all of these with a single keystroke at the start of any document.

TW-128 deserves even more praise than RAINBOW gave it.

H. Larry Elman
Port Jefferson, NY

HINTS & TIPS

Editor:

My old CoCo 1 "died" and was replaced with a new CoCo 3. As I am a one-hand, one-finger typist, I was scared stiff. All those special extra keys were quite intimidating to me.

As I struggled to master the monster, it gradually dawned on me that this new CoCo 3 was easier to use than the CoCo 1. The CTRL key gives me an un-shifted =, and both CTRL and ALT are duplicated at the right side of the keyboard. So, only a few exotic moves are barred to me. (I have little desire to gaze at the picture of the three bearded magi imbedded in the CoCo 3 guts.)

A new generation of users needs to be informed of the `A` and `E` commands in the edit mode. Microsoft seems to have carried over the edit module from the programs in other early Tandy micros. The `E` command is valuable because it allows you to escape from a mistake, putting you back in the command mode at square one, so you can untangle your fingers and re-enter edit mode without loss of ten minutes' labor.

The `A` command seems to do what the `L` command does — print the line and put you at the beginning.

I see the CoCo 3 still has the old `DLOAD` command, no longer operative from Disk BASIC. Vas dere a reason for dis, or vas it chust sloppy verk by der magi?

Bob Russ
Walworth, WI

Saving CoCo's Three Wise Men

Editor:

Here's a trick for the new CoCo 3. Almost everyone knows that when you press CTRL and ALT with the reset button pressed, you get a picture with three people and their names. So what's the new trick? The picture is stored on the PMODE4 graphics screen. When viewing this screen, you will see only the three people (not their names). To save this screen use the following steps: First, type PCLS1 and press ENTER. Press CTRL and ALT. Leaving them down, press the reset button. Release CTRL and ALT, press the reset button again, and the computer will cold start. Next, type in the following lines:

```
10 PMODE4:SCREEN1,1
20 CSAVEM"COCOTRIO",1536,7679,1536
```

Press the record button on your tape recorder and run the program. After the program is done, rewind the recorder to the beginning of the file and change Line 20 to: `20 CLOADM"COCOTRIO"`. Press play and run the program. To have the screen on disk, type in Line 20 as: `20 SAVEM"COCO TRIO",3584,9727,3584`, have your disk in the disk drive and run the program. Then change Line 20 to: `20 LOADM"COCOTRIO"` and type Line 30 as: `30 GOTO 30`. Run the program.

Mike Craig
South Haven, MI

REQUEST HOTLINE

Editor:

I got my first CoCo in 1984, and I had a subscription to RAINBOW for two years. I stopped my subscription because I outgrew it. I know you've got to keep the little tykes entertained, but how about me? I'm 36 years old.

At work I am building an equipment monitoring system using a CoCo that has 24 slave 8255 chips selected by a primary and a secondary master 8255 chip and an using techniques found in your magazine. The system is about 50 percent operative.

I've become sick and tired of slow BASIC program games, and I don't want to bother with OS-9. Assembly language programming is what I want to learn — specifically how to program graphics games using Radio Shack's Assembler. I have *TRS 80 Color Computer Assembly Language Programming* by William Barden, but it is definitely not game-oriented. I also have a copy of Don Inman's *Assembly Language Graphics for the TRS 80 Color Computer*, but it was written for a different assembler; as expected, when I type in the programs, they don't work.

Would you please devote a section in RAINBOW to helping me and many others grow into a higher level of programming, using assembly language game tutorials? I am ready to advance beyond Beginner's All Purpose, Symbolic Instruction Code.

Richard T. Maelhorn
State College, PA

See William Nee's second installment of "Machine Language Made BASIC on Page 137 of this issue. His 13-part series of ML tutorials, which began in last month's issue, will continue monthly through August '89.

Also, check out "The Little Graphics Library" by Kevin Dowd on Page 102 of this issue.

Printer Codes

Editor:

All of us have various types of printers; when a truly great program comes along and the author has not included the remarks regarding setting the printer codes, it is very frustrating to those who are not great programmers — or not programmers at all.

It would be a great service if this was one of the requirements when submitting a program to RAINBOW. In most cases, we can then go to our individual printer books, look up and change the codes, and *voila*, the program works.

I was very happy to see in the May issue one or two programs where the authors did this, and I commend them for thinking of us who need this. They put down the lines

and the codes, which was such a help.

I love your magazine and wait by my mailbox every month for it to arrive. Thanks to all of you who slave over your desks to bring this fine magazine to your readers.

Dorothy J. Koniq
Perris, CA

See Page 142 of this issue for coverage of printer control code differences.

KUDOS

Editor:

T & D Subscription Software is to be commended for their prompt service and reliability. Most orders are received within 10 days instead of the usual four-to-six weeks. Anybody looking for great software and excellent service should patronize this company.

W.A. Queen III
Bessemer City, NC

Up and Running

Editor:

Just a note to tell you about the good people of Second City Software: Ed Hathaway and Dave Barnes. I met them at RAINBOWfest in Chicago and bought *CoCo Max III* from them, and a Disto Super Controller 2 from the Disto booth. The controller wouldn't work for me. (Disto had been recommended to me by Ed and Dave of Second City.) I tried to find the trouble — including changing the EPROM — to no avail.

Then I called Second City, and Ed had Dave Barnes *call me*. After about an hour and a half on the phone, we got the controller working with my 1.2 DOS. The jumpers and the book were wrong. Thanks to Ed and Dave, I am up and running now.

George L. Schneeweiss
Chicago, IL

Hard Drive Help

Editor:

First, I would like to thank Chris Burke of Burke & Burke for his help getting me going with my hard drive. It seems that OS-9 Level II is hard coded, so that whenever it sees `/H0` in the boot strap, it goes to the hard drive to finish booting. This is fine as long as you already have your hard drive formatted and the `CMDS` directory copied to it. If you have just gotten a hard drive, set it up as `/A0` until you get it formatted and `CMDS` copied, then you can change it back to the `/H0` and will have no problems.

Robert J. Grubb
Gallipolis, OH

A New Subscriber

Editor:

I have used CoCos for over 10 years. Today is the first day I have seen your magazine. Ladies and gentlemen, I am duly impressed. My masters degree is in computer science (specifically in software engineering), but believe me, if I knew anything beneficial to your company, I would be asking for a job in a second! Maybe I should get a second degree?

It's obvious you put a lot of effort into this product. I'm proud to be your next subscriber. Good work!

T. Riley
President, Riley Programming
Ames, IA

PEN PALS

• I am 11 years old and looking for a pen pal about my age, especially girls, but guys are welcome also. I have a CoCo 3, FD 502 disk drive, and other accessories. All letters are guaranteed to be answered.

Mike Miller
c/o Greg Miller
P.O. Box 55
Somersville, CT 06072

• I am 15 years old and would really like some pen pals. I have a CoCo 2 and 3, a CCR-82 cassette recorder, a disk drive, CGP-115 printer and a DMP-106 printer.

Sir Fred Patrick Hooper
Rt. 1, Box 370
Stonewall, TX 78571

• I am 11 years old and own a CoCo 2, disk drive, cassette recorder and OS-9. I would like to correspond with someone who knows about how to do things in Adventures, asking questions about them, or just talking about anything. I'll answer as many letters as I can, as soon as they get to me.

Andrew Yarrows
26 Briggs St.
Easthampton, MA 01027

• I am interested in amateur radio operators using the CoCo. I have a CoCo 1 and 2, MC-10, FD 502 disk drive and a DMP-130A printer. I would like to exchange ideas and other information about this hobby.

Gene Chambers
2221 Lovvorn Rd.
Carrollton, GA 30117

• I would like to get in touch with all European CoCo 3 users — we can't be the only ones with this beautiful machine out here. We could exchange the latest information and help each other.

Peter Tutelaers
Stryperstraak 50A
5595 GD Leende
The Netherlands

• I am a 15-year-old boy and have a CoCo 2 with one single-sided drive. I would like to have pen pals anywhere in the world, especially North America.

Carlos Augusto A.C. Junior
Rua Marques de Valenca
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215 E. 15th
Beloit, KS 67420

• The K-Board in Gloucester, Va., welcomes your call. It is a *CoBBS* system, online 24 hours. K-Board is a 300/1200 baud board using three single-sided drives and one RAM disk. Call (804) 693-6151.

William Keller
Rt. 1, Box 616
Gloucester, VA 23061

• The Tandy Terminal BBS is online 24 hours/7days at (314) 966-8653 for all your CoCo 2 and 3 needs. We are running at 8-bits and no parity. To get connected, press the spacebar. We are running at 300/1200/2400 baud on a 512K CoCo 3 with two double-sided drives. Online games such as *Galactic Conflict* are available to play, and there are a number of downloads changed weekly.

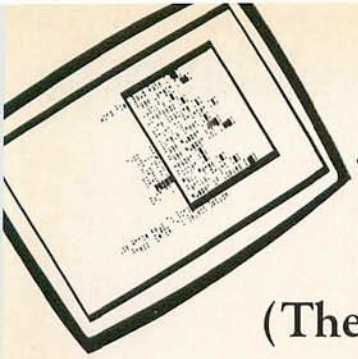
Thomas J. Wyrick
519 Meadow Creek Lane
St. Louis, MO 63122

• The Golden Kingdom RBBS has been up and running for nearly a year now. Although it is an *all* computer IBM system, I operate a CoCo conference (`J;COCO`) in the main menu. We have lots of public domain programs for downloads (pictures, games, utilities and OS-9) and a message base with bulletins. The number is (604) 562-1664. Supporting 3/12/24/9600 baud with no parity, 8-bits, 1 stop bit, 24 hours, 7 days a week.

Ross Evans
P.O. Box 2981
Prince George, B.C.
Canada V2N 4T7

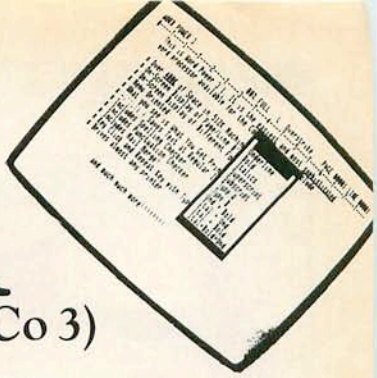
THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or to conserve space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, type `RAI` to take you into the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, type `LET` to reach the LETTERS> prompt and then select Letters for Publication. Be sure to include your complete name and address.



Word Power 3.1

(The Ultimate Word Processor for the CoCo 3)



Power Unleashed! Unlike other word-processors, Word Power 3.1 is written from scratch for the CoCo 3. It bridges the gap between "what is" and "what should be" in word-processors. **No other word processor offers such a wide array of features that are so easy to learn and use.**

DISPLAY

The **80-column display** with true lowercase lets you view the full width of a standard page. **All prompts are displayed in plain English in neat colored windows (see display above).** The current column number, line number, page number and percentage of free memory is displayed on the screen at all times. The program even **displays the bottom margin perforation** so you know where one page ends and the other begins. You can also change foreground/background color of screen and select menu and carriage return colors to suit your needs! Carriage returns can be visible or invisible. Word Power 3.1 runs at double clock speed and can be used with RGB/composite/monochrome monitors as well as TV.

AVAILABLE MEMORY

No other word processor gives you so much memory. Word Power 3.1 gives you **over 72K** on a 128K machine and **over 450K** on a 512K machine to store text.

EDITING FEATURES

Word Power 3.1 has one of the **most powerful and user-friendly full-screen editors with word-wrap.** All you do is type. Word Power 3.1 takes care of the text arrangement. It even has a built-in **Auto-Save** feature which saves the current text to disk at regular intervals; so you know that your latest version is saved to disk. Here are some of the impressive editing features of Word Power 3.1:

Insert/Overstrike Mode (Cursor style changes to indicate mode); OOPS recall during delete; **Type-ahead buffer** for fast typers; Key-repeat (adjustable) and Key-click; Four-way cursor control and scrolling; Cursor to beginning of text, end of text, beginning of line, end of line, top/bottom of screen, next/previous word; Page up/down; Delete character, previous/next word, beginning/end of line, complete line, text before and after cursor; Locate/Replace with **wild-card search** with auto/manual replace; Block Mark, Unmark, Copy, Move and Delete; Line Positioning (Left/Center/Right); Set/Reset 120 programmable tab stops; Word count. Define left, right, top and bottom margins and page length. You can also highlight text (underline – with **on-screen underlining,** bold, italics, superscripts, etc). Word Power 3.1 even has a **HELP screen** which can be accessed any time during edit.

MAIL-MERGE

Ever try mailing out the same letter to 50 different people or sending out several resumes? Could be quite a chore. Not with Word Power 3.1. Using this feature, you can type a letter, follow it with a list of addresses and have Word Power 3.1 print out personalized letters. It's that easy!

SAVING/LOADING TEXT

Word Power 3.1 creates ASCII format files which are compatible with almost all terminal, spell-checking and other word-processing programs. It allows you to load, save, append and kill files and also to create and edit Basic, Pascal, C and Assembly files. You can select files by simply cursoring through the disk directory. Supports double-sided drives and various step rates.

PRINTING

Word Power 3.1 drives almost any printer (DMP series, EPSON, GEMINI, OKIDATA, etc). Allows print options such as baud rates, line spacing, page pause, partial print, page numbers, page number placement, linefeed option, multi-line headers/footers, right justification and number of copies (see display above). The values for these parameters and the margins can be changed anytime in the text by embedding Printer Option Codes. Word Power 3.1 has the **WHAT YOU SEE IS WHAT YOU GET** feature which allows you to preview the text on the screen as it will appear in print. You can see margins, page breaks, justification and more.

SPELLING CHECKER

Word Power 3.1 comes with a **20,000** word spelling checker/dictionary which finds and corrects mistakes within your text. You can add words to or delete from the dictionary or create a dictionary of your own.

PUNCTUATION CHECKER

This checker will **proofread your text for punctuation errors** such as capitalization, spaces after periods/commas, double words and much more. It's the perfect addition to any word processor.

DOCUMENTATION

Writing with Word Power 3.1 is a breeze. Word Power 3.1 comes with a well-written, easy-to-comprehend instruction manual which will lead you step-by-step through the program.

Word Power 3.1 comes on an UNPROTECTED disk and is compatible with RS DOS 1.0/1.1 and ADOS. Only $79.95.

(Word Power 3 owners can get the 3.1 version by sending proof of purchase and $10.00 to cover the cost of shipping and the manual.)

I purchased your Word Power. It arrived in time for my 13 year old daughter to process her history fair project. Word Power was easy to use and the features beat the heck out of the other word processors we were using.

KBG Tallahassee / Florida

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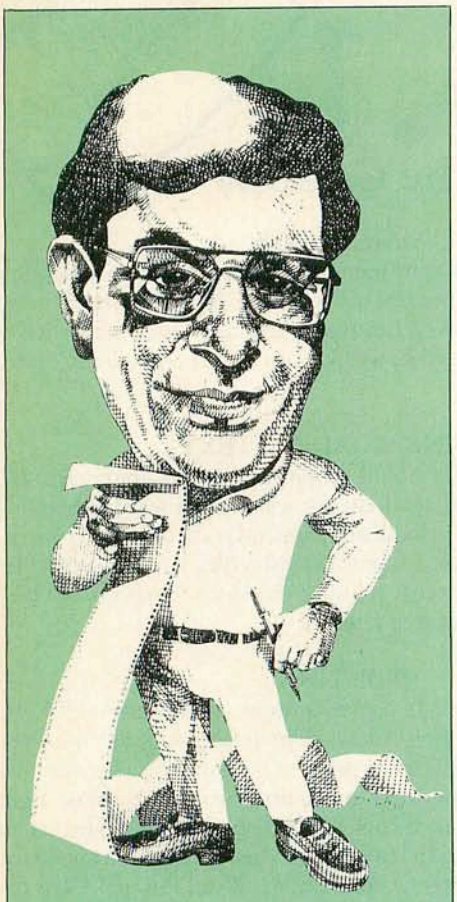

Some Post-RAINBOWfest Reflections

One of the things I love about the Color Computer market is its innovation. That was evident at RAINBOWfest more than ever, and it keeps showing up as more and more people begin dipping into what is rightly considered the best home and small-business computer system in the world!

I'd like you to take just five minutes to page through this issue of THE RAINBOW. Maybe you will note, as I have, that a number of new start-up companies are coming into the CoCo arena. Yes, we sometimes bemoan the fact that some of the larger software houses do not write (or adapt) programs for the Color Computer (except when they sell directly to Tandy), but the truth of the matter is that it has never been the big companies which have made this market a success.

Over the past several months we have seen more and more smaller firms take a fling at the Color Computer market. According to an informal survey I conducted just the other day, they are very pleased with their results so far. This has always been the hallmark of the CoCo market — new and innovative products from people who are interested and care about their products and the people who buy them.

And, because of those people, there are always new mountains to climb, new areas to explore for all of us. We're really fortunate to be able to have a computer that attracts the kind of innovative people who make the CoCo a continuing source of discovery.

A number of the "old hands" are out there innovating, as well. I'm going to mention one of them here: Bill Vergona of Cer-Comp, simply because Bill's is an interesting story.

Bill has been in the Color Computer market longer than just about anyone. He's one of the finest technical types we have, and he's written some excellent software to do the kind of technical things that technical types love — looking at bits and bytes and the like.

COCO 3 UTILITIES GALORE

(All utilities support 40/80 columns for CoCo 3)
(CoCo 2 versions are available for most utilities)

SUPER TAPE/DISK TRANSFER

● Disk-to-Disk Copy (1-3 passes) ● Tape-to-Disk Copy ● Tape-to-Disk Automatic Relocate ● Disk-to-Tape Copy ● Tape-to-Tape Copy
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Something possibly wrong with your CoCo? CoCo Checker is the answer! Will test your ROMs, RAMs, Disk Drives & Controller, Printer, Keyboard, Cassette, Joysticks, Sound, PIAs, VDG, Internal Clock Speed, Multi-pak Interface and more! **$24.95**

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Organize your videocassettes with this program! Allows you to index cassettes by title, rating, type, play time and comments. Also allows you to sort titles alphabetically and view/print selected tapes. If you own a VCR, this program is a must. Disk Only **$19.95** (CoCo 2 version included).

SCREEN DUMP

NEW

32, 40, 80 column text dump, PMODE 4 Graphics Dump. Single Keystroke Operation allows you to take snapshots of screens even when programs are running! Works on DMP's, Epson and Gemini. CoCo 1, 2 and 3. Disk Only **$24.95**

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Let the CoCo keep track of your bills. Allows you to enter bills under various categories and reminds you when they are due. Disk Only. **$19.95**

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NEW

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User friendly graphics interface with multiple "window" applications for Level II. Only **$54.95**

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Rainbow Guide To OS9 Level II: $19.95
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At RAINBOWfest Bill debuted a new offering, *Window Master*, which is quite a departure for him. Briefly, it is a windowing interface for the CoCo 3 that runs under the "regular" operating system, not OS-9.

I looked at it hurriedly while everyone, including Bill, was setting up. I try to stop by each booth at some point during the course of a show, but I had a hard time getting to Bill's at Chicago because there were lots and lots of people.

Bill seemed a little tired. Once the show was over, I found out why. Bill said he had literally been up for 36 hours beforehand, cleaning up the final code for *Window Master*. It ran smoothly at the show, of course, for Bill is a meticulous programmer. We talked about things late that Sunday, and I pointed out to Bill that *Window Master* was really his first "non-techie" program. He agreed.

As I write this, Bill is busy condensing his code to get the program to run in less than 512K. I am sure he will. And I am sure you will be interested in the product if you have a CoCo 3.

My only point to all this is that you find all sorts of surprises at RAINBOWfest and in the pages of THE RAINBOW. As I mentioned above, I am happy to see new players in the field, and I am also so very pleased to see others, like Bill Vergona, innovating and coming out with new products, new ideas and new concepts.

"A number of new start-up companies are coming into the CoCo arena."

It's what makes this Color Computer market so dynamic.

* * *

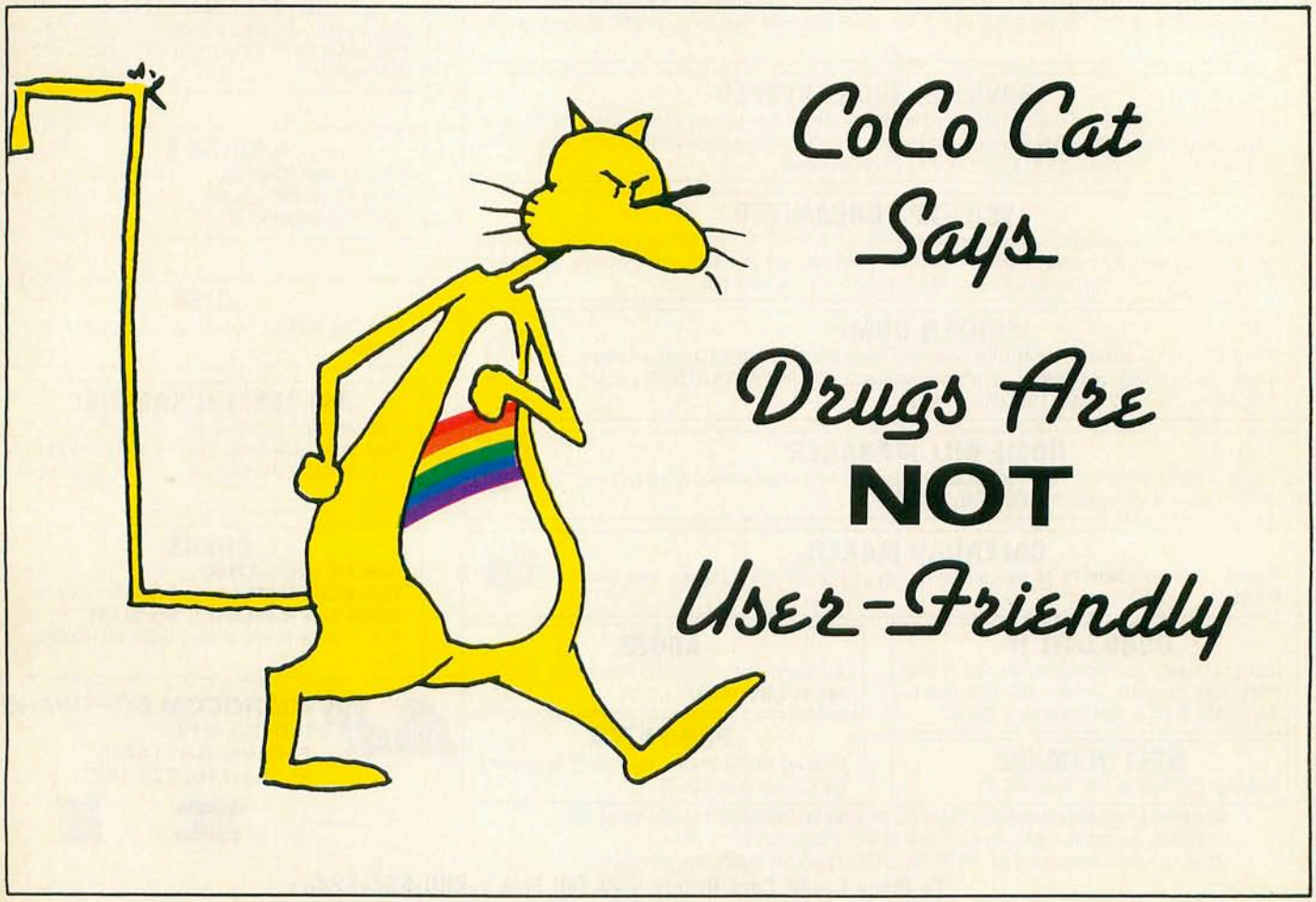
You may have noticed a difference when you got this month's issue of THE RAINBOW. We've gone from the paper wrapper we have been using to protect your favorite computer magazine in the mail, to a polybag. The polybag is tougher and allows us to place what are known as "outserts" in the magazine as well.

An "outsert," which I guess is the opposite of an "insert," lets us include things inside the polybag without having to go to the expense of binding it inside the magazine itself.

One of the changes is that you'll be getting an "outsert" notice when your subscription is about to run out rather than the notice printed on the paper wrapper. Another is that — we hope — some of our advertisers will be able to take advantage of the polybag and its "outserting" capability to include catalogs and the like inside the bag. It makes it easier for us to handle and less expensive for the advertiser to produce.

Finally, you may have noticed your favorite computer magazine "on the rack" at Waldenbooks, Cole's Books and several other locations. We've always been carried by a great number of Waldenbooks' stores, but now we will be in 1,100 of them nationwide. Not only will THE RAINBOW be in the stores, but we'll be on a special rack designed especially for computer magazines. Go by and see!

— Lonnie Falk



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FOR THE TRS-80 COCO

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How To Read Rainbow

When we use the term CoCo, we refer to an affectionate name that was first given to the Tandy Color Computer by its many fans, users and owners.

The BASIC program listings printed in THE RAINBOW are formatted for a 32-character screen — so they show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little disk and/or cassette symbols on the table of contents and at the beginning of articles indicate that the program is available through our RAINBOW ON DISK or RAINBOW ON TAPE service.

Using Machine Language

The easiest way to "put" a machine language program into memory is to use an editor/assembler, a program you can purchase from a number of sources. All you have to do, essentially, is copy the relevant instructions from THE RAINBOW's listing into CoCo.

Another method of putting an ML listing into CoCo is called "hand assembly" — assembly by hand, which *sometimes* causes problems with ORIGIN or EQUATE statements. You ought to know something about assembly to try this.

Use the following program if you want to hand-assemble ML listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I, VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program *assumes* you have a 16K CoCo. If you have 32K, change the &H3F00 in Line 10 to &H7F00 and change the value of I to &H7F80.

OS-9 and RAINBOW ON DISK

The OS-9 side of RAINBOW ON DISK contains two directories: CMDS and SOURCE. It also contains a file, `read.me.first`, which explains the division of the two directories. The CMDS directory contains executable programs and the SOURCE directory contains the ASCII source code for these programs. BASIC09 programs will only be offered in source form so they will only be found in the SOURCE directory.

OS-9 is a very powerful operating system. Because of this, it is not easy to learn at first. However, while we can give specific instructions for using the OS-9 programs, you will find that the OS-9 programs will be of little use unless you are familiar with the operating system. For this reason, if you haven't "learned" OS-9 or are not comfortable with it, we suggest you read *The Complete Rainbow Guide to OS-9* by Dale Puckett and Peter Dibble.

The following is not intended as a course in OS-9. It merely states how to get the OS-9 programs from RAINBOW ON DISK to your OS-9 system disk. Use the procedures appropriate for your system. Before doing so, however, boot the OS-9 operating system according to the documentation from Radio Shack.

1) Type `load dir list copy` and press ENTER.
2) If you have only one disk drive, remove the OS-9 system disk from Drive 0 and replace it with the OS-9 side of RAINBOW ON DISK. Then type `chd/d0` and press ENTER. If you have two disk drives, leave the sytem master in Drive 0 and put the RAINBOW ON DISK in Drive 1. Then type `chd/d1` and press ENTER.
3) List the `read.me.first` file to the screen by typing `list read.me.first` and pressing ENTER.
4) Entering `dir` will give you a directory of the OS-9 side of RAINBOW ON DISK. To see what programs are in the CMDS directory, enter `dir cmds`. Follow a similar method to see what source files are in the SOURCE directory.
5) When you find a program you want to use, copy it to the CMDS directory on your system disk with one of the following commands:

One-drive system: `copy /d0/cmds/` *filename* `/d0/cmds/` *filename* `-s`

The system will prompt you to alternately place the source disk (RAINBOW ON DISK) or the destination disk (system disk) in Drive 0.

Two-drive system: `copy /d1/cmds/` *filename* `/d0/cmds/` *filename*

Once you have copied the program, you execute it from your system master by placing that disk in Drive 0 and entering the name of the file.

The Rainbow Seal

RAINBOW CERTIFICATION SEAL

The Rainbow Certification Seal is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product that carries the Seal has actually been seen by us, that it does, indeed, exist and that we have a sample copy here at THE RAINBOW.

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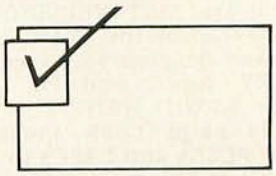
We will appreciate knowing of instances of violation of Seal use.

Rainbow Check Plus



The small box accompanying a program listing in THE RAINBOW is a "check sum" system, which is designed to help you type in programs accurately.

Rainbow Check PLUS counts the number and values of characters you type in. You can then compare the number you get to those printed in THE RAINBOW. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use *Rainbow Check PLUS*, type in the program and save it for later use, then type in the command RUN and press ENTER. Once the program has run, type NEW and press ENTER to remove it from the area where the program you're typing in will go.

Now, while keying in a listing from THE RAINBOW, whenever you press the down arrow key, your CoCo gives the check sum based on the length and content of the program in memory. This is to check against the numbers printed in THE RAINBOW. If your number is different, check the listing carefully to be sure you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on Page 21 of the February 1984 RAINBOW.

Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

```
10 CLS:X=256*PEEK(35)+178
20 CLEAR 25,X-1
30 X=256*PEEK (35)+178
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IFW=7985THEN80ELSEPRINT
   "DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 140, 60, 134
100 DATA 126, 183, 1, 106, 190, 1, 107
110 DATA 175, 140, 50, 48, 140, 4, 191
120 DATA 1, 107, 57, 129, 10, 38, 38
130 DATA 52, 22, 79, 158, 25, 230, 129
140 DATA 39, 12, 171, 128, 171, 128
150 DATA 230, 132, 38, 250, 48, 1, 32
160 DATA 240, 183, 2, 222, 48, 140, 14
170 DATA 159, 166, 166, 132, 28, 254
180 DATA 189, 173, 198, 53, 22, 126, 0
190 DATA 0, 135, 255, 134, 40, 55
200 DATA 51, 52, 41, 0
```

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AUTOMATIC 5 MIN. CASSETTE SAVE: #206
AUTOMATIC 5 MIN. DISK SAVE: #207
AUTO DIR BACK-UP:No more FS errors #208
BASE CONVERTER:#209
BANNER MAKER:7" high letters #210
BASIC SEARCH:Search for a string #211
BORDER MAKER:255 border styles #212
CASSETTE LABEL MAKER:DMP's only #213
CLOCK:Keeps time as you program #214
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COMMAND MAKER:Design own commands #216
COMMAND SAVER:Saves/recalls commands #217
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LOWER CASE COMMANDS: #247
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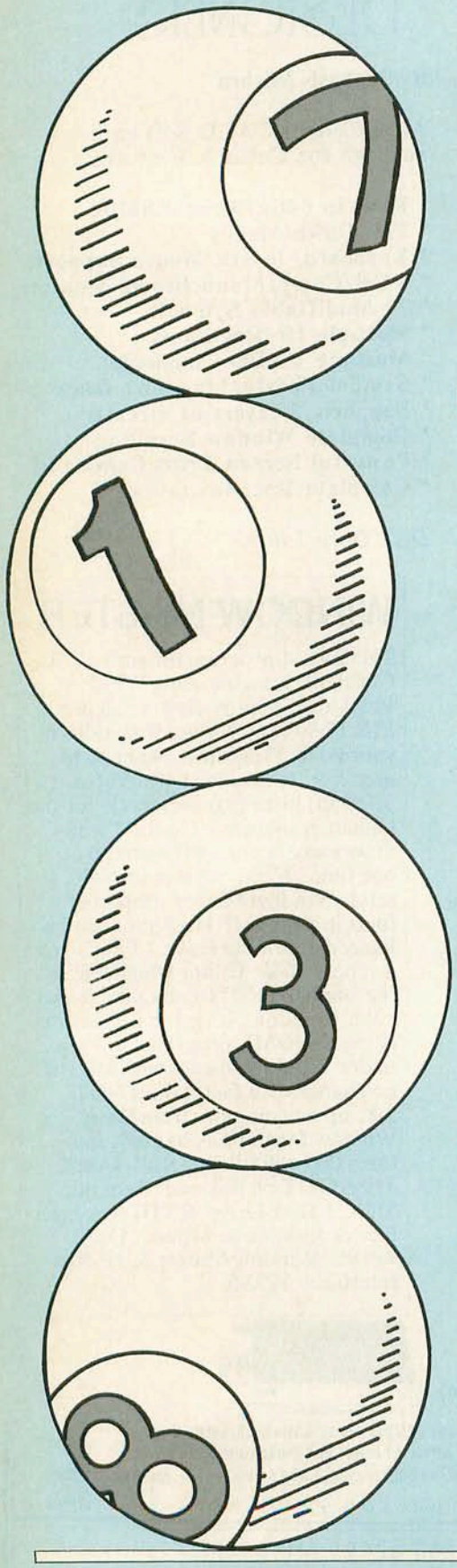

Solution to last month's logic problem

The Crazy Pool Ball Explained

By Bruce W. Ronald

The problem in last month's RAINBOW was to identify which of 12 pool balls was heavier or lighter than the others. You had only three weighings on a simple balance scale, which only tells if one side is heavier than the other, to solve the problem. The program also provided you with a way to test your algorithm.

One insight into the problem is that the most you can handle on the final weighing is three, and you must know each ball's proclivity. That is, if you weigh the first six balls on the left side of the scale against the second six on the right, and the left side of the scale goes down, you know that balls 1 through 6 have a proclivity to be heavy and 7 through 12 a proclivity to be light. If you end up with three suspects, all with a heavy proclivity, you can weigh one against the other — for instance, Ball 1 versus 2. If Ball 1 goes down, it's 'X'; the same goes for Ball 2. If the scales balance, X is Ball 3.

You soon learn that the first weighing, however, must be four balls against four; no other comparison yields so much information and elimination. Weigh balls 1, 2, 3 and 4 against 5, 6, 7 and 8. If the scale balances, the solution is fairly easy. You next weigh balls 9 and 10 against 11 and Y (any ball from the first eight that you know to be normal).

If this scale balances, Ball 12 is the deviant; weighing Ball 12 against Y determines if it is lighter or heavier. If balls 9 and 10 go down, it can only be because either 9 or 10 are heavier, or 11 is lighter; weigh 9 against 10 to finish the answer. If Ball 9 goes down, it is the "crazy" ball. Ditto for Ball 10. If this weighing balances, Ball 11 is light.

If the original weighing does not balance, we have a trickier problem. If group 1 through 4 goes down, we know that 1, 2, 3 or 4 could be heavy; or 5, 6, 7 or 8 could be light; or vice versa if group 1 through 4 goes up.

In this case the next weighing is balls 1, 2 and 5 against 3, 6 and Y. If group 1, 2, 5 drops, it can only be because 1 or 2 is heavy or 6 is light; a 1 versus 2 weighing produces the answer. If group 3, 6, Y drops, the crazy ball can only be Ball 5 (light) or Ball 3 (heavy). A weighing of one against Y produces the answer. If 1, 2, 5 and 3, 6, Y are equal, weigh Ball 7 against Ball 8. The lighter ball is the deviant. If 7 and 8 balance, the only possibility remaining is a heavy Ball 4.

Whoever dreamed up this problem originally was an evil genius! I hate to admit how many hours I spent before spotting the concept of proclivity and, finally, the trick of crossing the balls on the middle weighing. I hope you were much faster and that the program helped you prove the validity of your answer.

(Questions or comments concerning this solution may be addressed to the author at 101 Forrer Blvd., Dayton, OH 45419. Please enclose an SASE when requesting a reply.)

Bruce Ronald, an advertising copywriter, holds a bachelor's degree in speech. He has written a science fiction thriller, Our Man in Space, *and the book of the musical,* Dracula, Baby. *He and his wife, Virginia, coauthored two prize-winning local histories of Dayton and its suburb, Oakwood — the latter on the CoCo.*

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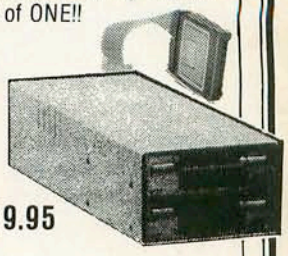

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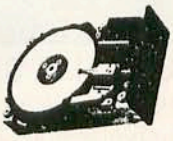

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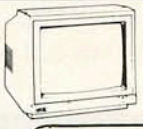

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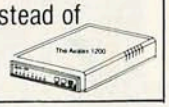

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BLINDING SPEED
Max-10 is entirely written in machine language. Its speed will amaze you.

SLEEK
A lot of word processors "do the job", but Max-10 makes word processing fun.

INTUITIVE
Max-10 is so well designed you can use it without reading the manual.

FUN
Max-10 is actually fun to use, which is quite an achievement for a word processor.

FORMAT
Unlimited choice of right or left alignment, centering, and line spacing. Screen is updated immediately to show exact effects of changes.

PAGE NUMBERING
On-screen page number helps you find your place.

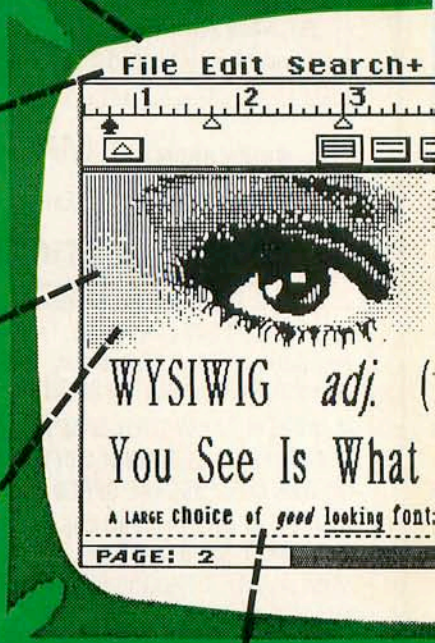
SUPERB FILE SUPPORT
Max-10 menus let you load files without typing anything: simply point and click.

FILE COMPATIBILITY
Max-10 can import files from your outmoded word processor.

GRAPHICS
Mix text and graphics on your page. Pictures can be created by CoCo Max, the DS-69 Digitizer, or any graphics editor.

FIT IT IN
Pictures can be shrunk and stretched in both directions to fit the page and text.

TAB STOPS & MARGINS
The rulers make tabs and margins easy to see, use, and change.



CUT AND PASTE
Move anything (even graphics) anywhere in the document.

Max-10 Specifications: variable line length; right, left, top and bottom margins; word wrap; undo; page numbering; set starting page; left and right justification; centering; margins and centering can be changed anywhere in the document; variable line spacing; programmable headers and footers (with centering, graphics, etc.); type ahead; key repeat; key click; scroll up and down; jump to any point in document; ASCII file ouput for compatibility; disk directory; kill files; bold, italic, underline, superscript and subscript type styles; wordwrap; block cut, copy, move; global search and replace; paragraph indent; clipboard; merge; show file (on disk); free memory display, page count, paragraph count, word count, graphics can be resized and moved; multiple fonts; error recovery and more!

PRINTERS
Max-10 currently works with the following printers: DMP-105, DMP-106, DMP-130, Epson MX,RX,FX,LX and compatible, Gemini 10 series, CGP-220, and OKI-92.

BY DAVE STAMPE
Author of CoCo Max III, the best and most acclaimed CoCo 3 Graphics Editor.

GRAPHICS
Max-10 can import pictures stored in the following formats: CoCo Max I,II,III, MGE, MGF, 5 level DS-69, as well as any standard PMODE 4, HSCREEN 2 or 3 picture.

THE DAZZLING WORD PROCESSOR
AND DOCUMENT CREATOR FOR THE COCO 3

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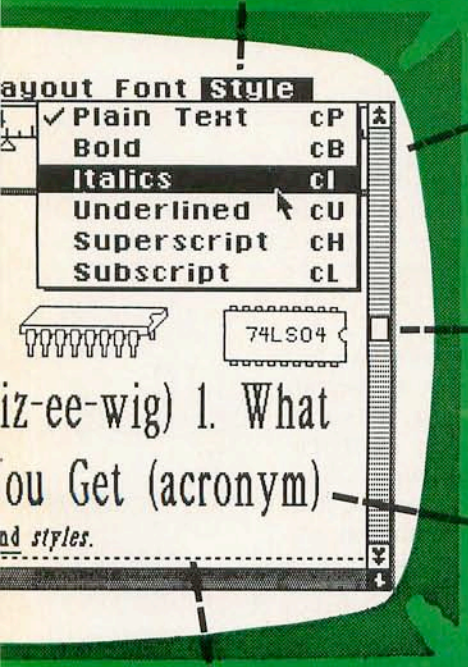
All Max-10 Functions can be easily accessed through the six pull-down menus. There are no commands to learn.

WYSIWYG!
What You See Is What You Get. Max-10 is the only CoCo word processor with graphics where the printout looks exactly like the screen (Macintosh style).



UNDO
The undo feature lets you change your mind even AFTER you make a drastic change, such as a "block delete".

SCROLL BOX
Point and click for lightning fast access to any point in the entire document.

MORE FONTS
Max-10 features 20 different fonts (styles and sizes). It goes well beyond your printer's built in character sets.

PAGE BREAK
Dotted lines on the screen show where pages begin and end. No more surprises at printing time.

TOTAL CONTROL
Any number of available character styles and sizes can be mixed on the same line.

FULL JUSTIFICATION
Proportionally spaced characters let you create text that looks really nice. No more squished "M"s and oversized "I"s.

HEADERS & FOOTERS
These are super easy to add and edit. They can even include graphics and pictures!

Why Max-10?

Most of you already have an "adequate" word processor, so why did we spend considerable time and effort to create **Max-10**?
Because you asked for it. **CoCo Max** made graphic creation fun. It is fast and feature loaded, yet amazingly easy to use. You wanted your word processor to be as friendly, forgiving, and amazing as **CoCo Max**. We couldn't do it on the CoCo 1 or 2, but with the advanced CoCo 3 graphics, the word processor you always wanted is here: **Max-10**
Max-10 is not just a word processor. It gives you letter styles and sizes that your printer doesn't have. It lets you mix graphics and pictures in your text for a professional looking output.
Additionally, the screen shows exactly what your output will look like. Text is in the size and style that it will print. Page breaks, line length and spacing are clearly shown. No more hoping that the text will fit, no more guessing at type styles, no more messing with printer codes, no more cryptic commands to memorize, and best of all, the undo feature lets you make a mistake and still recover your text.
Max-10 makes typing easy, and you'll love the new things you can do with the best word processor ever created for the CoCo.

PRICE: $79.95

CoCo Max III OWNERS
If you already own CoCo Max III, deduct $10 from your order.

SYSTEM REQUIREMENTS
Any CoCo 3 (128K or 512K) with at least 1 Disk Drive.
Mouse or joystick.
Monochrome, RGB or Composite monitor.

COLORWARE
A division of Sigma Industries, Inc.

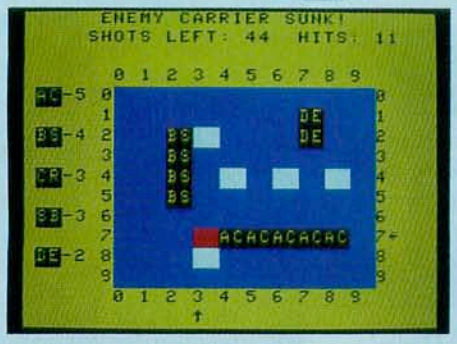
TO ORDER
Call (203) 656-1806 9 to 5 Eastern time
Visa or Mastercard accepted. C.O.D orders $3 extra
Send check or M.O. to: Colorware, 242-W West Ave, Darien CT 06820
Add $3 per order for shipping ($5 to Canada, 10% to overseas).
CT residents add 7.5% sales tax

There are ships out there — waiting for you

SeaWar

By Jeff Hameluck

Sea War is a one-player game where you try to sink the ships the CoCo has hidden on a 10-by-10 grid. It requires at least 16K Extended Color Basic and the standard CoCo joystick or mouse. It does not use high resolution graphics, but it does use multi-dimensional arrays, thereby requiring Extended Color Basic. *Sea War* will also run on the CoCo 3 if it is run on the 32-column text screen.



When you run *Sea War*, a title screen will appear and theme music will play. To start the game simply press the right joystick button, and the game will continue. There is no need to wait for the music to cease. The next screen simply gives a little background information about the game's scenario. To continue, press the right joystick button once again. Next, the information on the ships you must sink is displayed (See Figure 1).

Jeff Hameluck is a high school senior who has won a BASIC programming contest sponsored by the Regina Student Chapter of the Association for Computing Machinery.

After you press the button again, the game begins. The computer will put the five ships somewhere on the 10-by-10 grid. It is your job to sink all of the ships in 60 shots or less. The ships will be placed on the grid either vertically or horizontally, but not diagonally. The length of each ship is the same as the number of hits it requires to sink the ship. Therefore, since it takes five hits to sink an Aircraft Carrier, an Aircraft Carrier will be five units long, and so on. Also, each hit has to be in a different part of the ship. In other words, once one part of the ship is hit, a second shell there will just waste ammunition; the shell counts as a shot, not a hit.

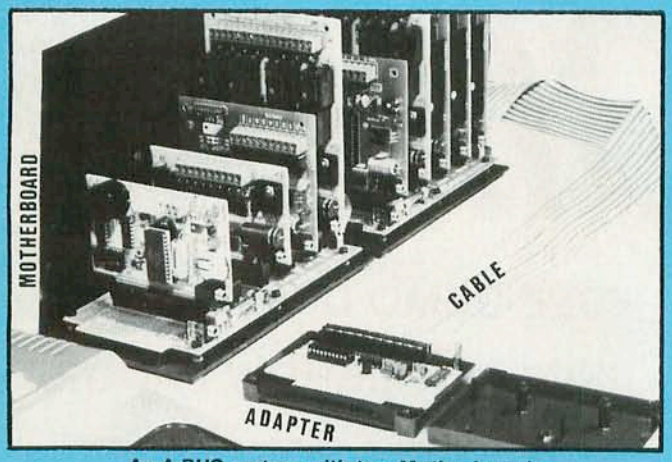
Aircraft Carrier:	5 hits to sink
Battle Ship:	4 hits to sink
Crusier:	3 hits to sink
Submarine:	3 hits to sink
Destroyer:	2 hits to sink

Figure 1

To shoot, use the right joystick to move the cursor on the screen over the top of the square you want to shoot. There are pointers along the vertical and horizontal axes to help guide you. Once you are positioned, press the button. If the square comes up white, there is no ship there. If it comes up showing anything but white, you have hit a ship. The ship will be represented by a two-letter acronym on the game board. The type and location of the ship will be displayed at the top of the screen. The acronyms are listed on the left side of the screen with the number of hits

The Amazing A-BUS

NEW



An A-BUS system with two Motherboards A-BUS adapter in foreground

The A-BUS system works with the original CoCo, the CoCo 2 and the CoCo 3.

Plug into the future

With the A-BUS you can plug your PC (IBM, Apple, TRS-80) into a future of exciting new applications in the fields of control, monitoring, automation, sensing, robotics, etc.

Alpha's modular A-BUS offers a proven method to build your "custom" system today. Tomorrow, when you are ready to take another step, you will be able to add more functions. This is ideal for first time experimenting and teaching.

A-BUS control can be entirely done in simple BASIC or Pascal, and no knowledge of electronics is required!

An A-BUS system consists of the A-BUS adapter plugged into your computer and a cable to connect the Adapter to 1 or 2 A-BUS cards. The same cable will also fit an A-BUS Motherboard for expansion up to 25 cards in any combination.

The A-BUS is backed by Alpha's continuing support (our 11th year, 50000 customers in over 60 countries).

The complete set of A-BUS User's Manuals is available for $10.

About the A-BUS system:

- All the A-BUS cards are very easy to use with any language that can read or write to a Port or Memory. In BASIC, use INP and OUT (or PEEK and POKE with Apples and Tandy Color Computers)
- They are all compatible with each other. You can mix and match up to 25 cards to fit your application. Card addresses are easily set with jumpers.
- A-BUS cards are shipped with power supplies (except PD-123) and detailed manuals (including schematics and programming examples).

Relay Card — RE-140: $129

Includes eight industrial relays, (3 amp contacts, SPST) individually controlled and latched. 8 LED's show status. Easy to use (OUT or POKE in BASIC). Card address is jumper selectable.

Reed Relay Card — RE-156: $99

Same features as above, but uses 8 Reed Relays to switch low level signals (20mA max). Use as a channel selector, solid state relay driver, etc.

Analog Input Card — AD-142: $129

Eight analog inputs. 0 to +5V range can be expanded to 100V by adding a resistor. 8 bit resolution (20mV). Conversion time 120us. Perfect to measure voltage, temperature, light levels, pressure, etc. Very easy to use.

12 Bit A/D Converter — AN-146: $139

This analog to digital converter is accurate to .025%. Input range is −4V to +4V. Resolution: 1 millivolt. The on board amplifier boosts signals up to 50 times to read microvolts. Conversion time is 130ms. Ideal for thermocouple, strain gauge, etc. 1 channel. (Expand to 8 channels using the RE-156 card).

Digital Input Card — IN-141: $59

The eight inputs are optically isolated, so it's safe and easy to connect any "on/off" devices, such as switches, thermostats, alarm loops, etc. to your computer. To read the eight inputs, simply use BASIC INP (or PEEK).

24 Line TTL I/O — DG-148: $65

Connect 24 input or output signals (switches or any TTL device) to your computer. The card can be set for: input, latched output, strobed output, strobed input, and/or bidirectional strobed I/O. Uses the 8255A chip.

Clock with Alarm — CL-144: $89

Powerful clock/calendar with: battery backup for Time, Date and Alarm setting (time and date); built in alarm relay, led and buzzer; timing to 1/100 second. Easy to use decimal format. Lithium battery included.

Touch Tone® Decoder — PH-145: $79

Each tone is converted into a number which is stored on the board. Simply read the number with INP or POKE. Use for remote control projects, etc.

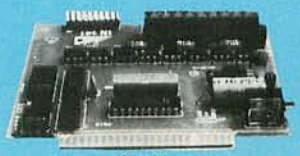
A-BUS Prototyping Card — PR-152: $15

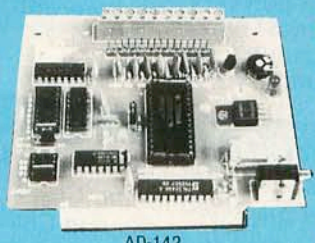
3½ by 4½ in. with power and ground bus. Fits up to 10 I.C.s


ST-143


CL-144


RE-140


IN-141


AD-142

Smart Stepper Controller — SC-149: $299

World's finest stepper controller. On board microprocessor controls 4 motors simultaneously. Incredibly, it accepts plain English commands like "Move arm 10.2 inches left". Many complex sequences can be defined as "macros" and stored in the on board memory. For each axis, you can control: coordinate (relative or absolute), ramping, speed, step type (half, full, wave), scale factor, units, holding power, etc. Many inputs: 8 limit & "wait until" switches, panic button, etc. On the fly reporting of position, speed, etc. On board drivers (350mA) for small steppers (MO-103). Send for SC-149 flyer.

Remote Control Keypad Option — RC-121: $49
To control the 4 motors directly, and "teach" sequences of motions.

Power Driver Board Option — PD-123: $89
Boost controller drive to 5 amps per phase. For two motors (eight drivers).

Breakout Board Option — BB-122: $19
For easy connection of 2 motors. 3 ft. cable ends with screw terminal board.

Stepper Motor Driver — ST-143: $79

Stepper motors are the ultimate in motion control. The special package (below) includes everything you need to get familiar with them. Each card drives two stepper motors (12V, bidirectional, 4 phase, 350mA per phase).

Special Package: 2 motors (MO-103) + ST-143: **PA-181: $99**

Stepper Motors — MO-103: $15 or 4 for $39

Pancake type, 2¼" dia, ¼" shaft, 7.5°/step, 4 phase bidirectional, 300 step/sec, 12V, 36 ohm, bipolar, 5 oz-in torque, same as Airpax K82701-P2.

Current Developments

Intelligent Voice Synthesizer, 14 Bit Analog to Digital converter, 4 Channel Digital to Analog converter, Counter Timer, Voice Recognition.

A-BUS Adapters for:

IBM PC, XT, AT and compatibles. Uses one short slot	AR-133...$69
Tandy 1000, 1000 EX & SX, 1200, 3000. Uses one short slot	AR-133...$69
Apple II, II+, IIe. Uses any slot.	AR-134...$49
TRS-80 Model 102, 200 Plugs into 40 pin "system bus"	AR-136...$69
Model 100. Uses 40 pin socket. (Socket is duplicated on adapter).	AR-135...$69
TRS-80 Mod 3,4,4D. Fits 50 pin bus. (With hard disk, use Y-cable).	AR-132...$49
TRS-80 Model 4P. Includes extra cable. (50 pin bus is recessed).	AR-137...$62
TRS-80 Model I. Plugs into 40 pin I/O bus on KB or E/I.	AR-131...$39
Color Computers (Tandy). Fits ROM slot. Multipak, or Y-cable.	AR-138...$49

A-BUS Cable (3 ft, 50 cond.) — CA-163: $24

Connects the A-BUS adapter to one A-BUS card or to first Motherboard.

Special cable for two A-BUS cards: CA-162: $34

A-BUS Motherboard — MB-120: $99

Each Motherboard holds five A-BUS cards. A sixth connector allows a second Motherboard to be added to the first (with connecting cable CA-161: $12). Up to five Motherboards can be joined this way to a single A-BUS adapter. Sturdy aluminum frame and card guides included.

- The A-BUS is not a replacement for the Multi-pak

Add $3.00 per order for shipping.
Visa, MC, checks, M.O. welcome.
CT & NY residents add sales tax.
C.O.D. add $3.00 extra.
Canada: shipping is $5
Overseas add 10%

a Sigma Industries Company

ALPHA Products

242-W West Avenue, Darien, CT 06820

Technical info: **(203) 656-1806**
Orders only (Except in CT) **800 221-0916**
Connecticut orders: **(203) 348-9436**
All lines open weekdays 9 to 5 Eastern time

SPECIAL

WITH YOUR
COCO MAX III ORDER:

- FREE DEMO DISK
- FREE COCOSHOW PROGRAM
- FREE EXTRA FONTS DISK

CoCo Max™ III

must be the most enjoyable, useful, and awesome program you've ever seen or your money back. Instantly, no questions asked.

CALL NOW TOLL FREE 1-800 221 Mon-Fri 9 to 5 EST **AND LET THE FUN BEGIN**

A FEW QUOTES :

An outstanding program that almost turns your CoCo into a replica of the Macintosh. Terrific hi-res color, very easy to learn and use.
- Family Computing

There is absolutely nothing else on the Color Computer that is comparable to CoCo Max's power and ease of use. The most enjoyable time with a computer I ever had.
- Computerware Review

In Everyone's book, CoCo Max is rated again and again as the most incredible product ever marketed for the CoCo.
–CoCo America Club

I never expected to see anything like it on my CoCo screen. There isn't a single command to remember. Even a person who has no drawing ability like myself can create a presentable picture. I've spent hours just doodling enjoying all the things from silly to the serious. Fascinating experience. Buy it, you won't be sorry.
- 6809 Express

Note: There is only one *CoCo Max III*. Do not confuse COLORWARE's *CoCo Max* with similar sounding imitations.

INTRODUCING THE NEXT GENERATION: CoCo Max™ III*

More Resolution · More Power · More Color · Built-in Animation · More Speed · More Type Styles · More Tools · Amazing Color Sequencing

"The best program ever written for the Color Computer"

That's how thousands of enthusiastic users rated the **CoCo Max II** drawing program. With **CoCo Max III** we are ready to amaze them again. Instead of "patching" CoCo Max II, we rewrote it from scratch to take advantage of the CoCo Max III hardware. The results will knock your socks off! Below is a brief list of some of the *new* features, but some, such as **animation**, **color sequencing**, or the **slide show**, have to be seen. Send for the Demo Disk, and see for yourself.

Everybody's favorite drawing package features:
- A 50% larger editing window. - Zoom area **400%** larger. - New drawing tools: **rays**, **3D cubes**, **arcs**,... - New editing tools: shadow,text size,... - Rotate by 1.5° steps - Select any 16 of the 64 possible colors (all 64 colors displayed at once!) - Powerful **color mix**: additive, subtractive, overlay,... - Full **color editing** of patterns and color changing patterns. - Incredible **special effects** with **color cycling** up to 8 colors with variable speed. -**Animation** adds the dimension of motion to your image. (Must be seen.) - Sophisticated data compression saves up to 70% of disk space when saving pictures.

In addition, there are dozens of enhancements to the multitude of features that made CoCo Max II a best seller.

Imagine this picture in sixteen colors!

Guaranteed Satisfaction
Use CoCo Max for a full month. If you are not delighted with it, we will refund every penny.

More about CoCo Max III
- CoCo Max III is not an upgrade of CoCo Max II. It is entirely rewritten to take advantage of the new CoCo 3 hardware (More memory, resolution, colors, speed,...)
- The new CoCo Max III **Hi-Res Interface** and the CoCo Max II **Hi-Res Pack** are *not* interchangable.
- The new interface plugs into the joystick connector.
- The CoCo Max III disk is not copy protected.
- CoCo Max III only works with the CoCo 3.
- A Y-Cable or Multi-pak is not necessary.
- Colors are printed in five shades of gray.
- CoCo Max III can read CoCo Max II pictures.

Note: CoCo Max II (for the CoCo 2) is still available on disk ($79.95). CoCo Max I is still available on tape ($69.95). For details, refer to our double page ad in any *Rainbow* from January '86 to July '87

System Requirements:
Any CoCo 3 disk system with a Joystick or a Mouse.

We apologize to tape users, CoCo Max III needs the flexibility of a disk.

The **CoCo Max III** system includes: • The special Hi-Res interface (for your mouse or joystick) • The CoCo Max III disk • Many utilities: (To convert Max II pictures, Max colors, etc.) • A detailled User's Manual. Complete system; nothing else to buy. **CoCo Max III: $79.95***

Toll Free operators are for orders only. If you need precise answers, call the **tech line**. (Detailled CoCo Max specs are included with the Demo Disk.)

Add $3.00 per order for shipping.
Visa, MC, checks, M.O. welcome.
CT residents add sales tax.
C.O.D. add $3.00 extra.
Canada: shipping is $5
Overseas add 10%

Technical info: **(203) 656-1806**
Orders only (Except in CT) **800 221-0916**
Connecticut orders: **(203) 348-9436**
All lines open weekdays 9 to 5 Eastern time

* Beware of inferior imitations that *DO NOT* include a Hi-Res Interface or charge extra for each utility.

WITH COUPON ONLY

FREE DEMO DISK

Name _____

Street _____

City _____

State Zip _____

Printer used: _____

Please include $2 to help defray Processing and Shipping costs. (Check, Money Order, etc. Sorry, no COD or Credit Cards). Coupon (or copy) must be mailled to:

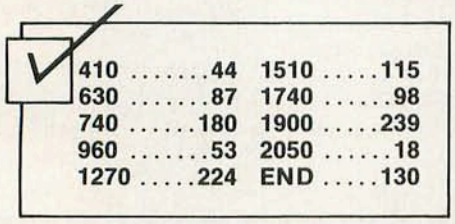
COLORWARE
A division of Sigma Industries, Inc.

COLORWARE
242-W West Avenue
Darien, CT 06820

required to sink that vessel.

The game will end after you have either hit and sunk all five ships or used up all 60 rounds of ammunition. Either way, the screen will display the true locations of all the ships. You will then be given a rating of one to 10 based on your shots-to-hits ratio. To play again, press Y or the right joystick button. To quit, press N. If neither of these keys are pressed, the game will start over at the theme song.

(Questions or comments regarding this program may be directed to the author at 67 Dutton Crescent, Regina, Saskatchewan, Canada S4N 4E4. Please enclose an SASE when requesting a reply.) □



410	44	1510	115
630	87	1740	98
740	180	1900	239
960	53	2050	18
1270	224	END	130

The listing: SEAWAR

```
100 '
110 ' +---------------------+
120 ' :    S E A   W A R    :
130 ' +---------------------+
140 ' :                     :
150 ' : COPYRIGHT (C)  1988 :
160 ' :                     :
170 ' +---------------------+
180 ' :                     :
190 ' :  by: Jeff Hameluck  :
200 ' :                     :
210 ' +---------------------+
220 '
230 CLS 0
240 PRINT @ 33,STRING$(30,191);
250 FOR X=65 TO 417 STEP 32
260 PRINT @ X,CHR$(191);
270 PRINT @ X+29,CHR$(191);
280 NEXT X
290 PRINT @ 449,STRING$(30,191);
300 A$="jeff"
310 GOSUB 490
320 PRINT @ 100,B$;
330 A$="hameluck"
340 GOSUB 490
350 PRINT @ 109,B$;
360 A$="proudly"
370 GOSUB 490
380 PRINT @ 169,B$;
390 A$="presents"
400 GOSUB 490
410 PRINT @ 232,B$;
420 A$="sea"+CHR$(128)+"war"
430 GOSUB 490
440 PRINT @ 297,B$;
450 B$=CHR$(128)
460 PRINT @ 356,"press";B$;"the"
;B$;"right";B$;"joystick";
470 PRINT @ 393,"button";B$;"to"
;B$;"play";
480 GOTO 550
490 B$=""
500 FOR X=1 TO LEN(A$)
510 B$=B$+MID$(A$,X,1)+CHR$(128)
520 NEXT X
530 B$=LEFT$(B$,LEN(B$)-1)
540 RETURN
550 FOR X=1 TO 55
560 READ A$
570 PP=PEEK(65280)
580 IF PP=254 OR PP=126 THEN 660
590 PLAY A$
600 NEXT X
610 RESTORE
620 GOTO 550
630 DATA "T5L804C","O3B","O4L4C"
,"O3C","C","L8G","F","E","G","O4
C","O3B","O4C","L804E","D","C","
O4"
640 DATA "L4D","O3D","D","L8D","
C","O2B","O3G","G","F+","L4G","L
803A","B","O4C","O3B","A","G","A
"
650 DATA "G","F","E","F","E","D"
,"C","D","C","O2B","A","L802G","
O3C","O2B","O3D","C","E","D","F"
,"L4E","C","C"
660 CLS
670 PRINT
680 PRINT"  YOU COMMAND A SHORE
BATTERY   WHICH HAS BEEN ORDERED
 TO SINK  AN ENEMY FLEET ANCHORE
D IN A    FOGGY COVE IN FRONT OF
 YOU. YOU CAN'T SEE THE SHIPS RI
GHT AWAY  BUT AS SOON AS YOU HIT
 ONE THE  LOCATION AND TYPE OF S
HIP WILL  BE KNOWN";
690 PRINT" BECAUSE THE EXPLOSION
  WILL HIGHLY ILLUMINATE THE
  THE IMMEDIATE AREA FOR A SHORT
  TIME.  YOU ONLY HAVE 60 ROUNDS
  TO SINK THE 5 SHIP ENEMY FLEET
  WHICH CONSISTS OF:"
700 PRINT @ 482,"PRESS THE BUTTO
N TO CONTINUE";
710 FOR X=1 TO 200
720 NEXT X
730 PP=PEEK(65280)
740 IF PP=254 OR PP=126 THEN 750
 ELSE 730
750 CLS:PRINT"AIRCRAFT CARRIER-5
 HITS TO SINK BATTLE SHIP     -4
 HITS TO SINK CRUISER         -3
 HITS TO SINK SUBMARINE       -3
 HITS TO SINK DESTROYER       -2
 HITS TO SINK"
760 PRINT @ 482,"PRESS THE BUTTO
N TO CONTINUE";
770 FOR X=1 TO 200
780 NEXT X
790 PP=PEEK(65280)
```

VIP Writer III

VIP Writer has ALWAYS led the pack with features and now VIP Writer III still leads the way! The chart below illustrates this fact. Telewriter 128 only gives you 48K for text. Why is it called Telewriter 128? Word power 3 gives only 72K! VIP Writer III makes use of over 106K! VIP Writer III is the ONLY CoCo 3 word processor worthy of it's name!

WORD PROCESSOR COMPARISON CHART			
CoCo3 with 128K	VIP Writer III	Telewriter 128	Word Power 3
Text Storage	OVER 49,000	48,000	72,000
Print Spooler	YES 57,000	NONE	NONE
Total Storage	**106,000**	48,000	72,000
Spelling Checker	VIP Speller	NONE	FREE WARE
RGB HD Support	100%	NONE	NONE
Screen Display	32/40/64/80	40/80	80

SCREEN DISPLAY OPTIONS

As the chart above shows - VIP Writer III offers more screen width options -all with 24 lines and actual lower case letters. It uses the CoCo 3's hardware display and double clock speed and is VERY VERY FAST! You can choose fore and background colors from up to 64 different hues. Color can be turned ON or OFF for the best possible display using a color or monochrome monitor or TV set. VIP Writer III has a built in on-line context sensitive help facility which displays command usage in easy to read colored windows.

CUSTOMIZER & PRINTER INSTALLER

VIP Writer III comes with a configuration / printer installation program which lets you customize VIP Writer III to suit your own liking. You can set screen width and colors as well as margins and more. You can also install your own printer and set interface type (serial, parallel or J&M), baud rate, line feeds, etc. Once done, you never have to enter these parameters again! VIP Writer III will load n' go with your custom configuration every time!

TEXT FILE STORAGE

VIP Writer III creates ASCII text files which are compatible with all other VIP Programs as well as other programs which use ASCII file format. You can use VIP Writer III to even create BASIC programs! There is a 49K text buffer and disk or cassette file linking allowing virtually unlimited text space. VIP Writer III works with up to four disk drives and lets you display disk directories and free space as well as rename or kill disk files. In addition VIP Writer III is 100% compatible with the RGB Computer Systems HARD DISK.

EDITING FEATURES

VIP Writer III has a full featured screen editor which can be used to edit text with lines up to 240 characters long with or without automatic word wrap around. You can select type-over mode or insert mode. There is even an OOPS command to recall a cleared text buffer. Other editing features include: Type-ahead • typamatic key repeat and key beep for flawless text entry • end of line bell • full four way cursor control with scrolling • top of textfile • bottom of textfile • page up • page down • top of screen • bottom of screen • beginning of line • end of line • left one word • right one word • DELETE character, to beginning or end of line, word to the left or right, or entire line • INSERT character or line • LOCATE and/or CHANGE or DELETE single or multiple occurrence using wildcards • BLOCK copy, move or delete with up to TEN simultaneous block manipulations • TAB key and programmable tab stops • word count • line restore • three PROGRAMMABLE FUNCTIONS to perform tasks such as auto column creation and multiple copy printing.

TEXT FORMATTING

VIP Writer III automatically formats your text for you or allows you to format your text in any way you wish. You can change the top, bottom, left or right margin and page length. You can set your text flush left, center or flush right. You can turn right hand justification on or off. You can have headers, footers, page numbers and TWO auxiliary lines which can appear on odd, even or all pages. You can also select the line on which they appear! You can even change the line spacing! Parameters can be altered ANYWHERE!

PREVIEW PRINT WINDOW

VIP Writer III features an exclusive format window which allows you to preview your document BEFORE PRINTING IT! You are able to move up, down, left and right to see centered text, margins, page breaks, orphan lines etc. This makes hyphenation a snap!

PRINTING

VIP Writer III prints TWICE as fast as any other CoCo word processor! It supports most serial or parallel printers using J&M JFD-CP or Rainbow interface and gives you the ability to select baud rates from 110 to 19,200. You can imbed printer control codes anywhere in your text file EVEN WITHIN JUSTIFIED TEXT! VIP Writer III also has TWENTY programmable printer macros which allow you to easily control all of your printers capabilities such as bold, underline, italics and superscript using simple key strokes. Other features include: multiple copy printing • single sheet pause • line feeds.

PRINT SPOOLING

Save up to $150 on a print spooler because VIP Writer III has a built in print spooler with a 57,000 character buffer which allows you to print one document WHILE you are editing another. You don't have to wait until your printer is done before starting another job!

DOCUMENTATION

VIP Writer III is supplied with a 125 page instruction manual which is well written and includes many examples. The manual has a tutorial and glossary of terms for the beginner as well as a complete index! VIP Writer III includes VIP Speller. DISK $79.95
Cassette version does not include VIP Speller. TAPE $59.95

VIP Writer owners: Upgrade to the VIP Writer III Disk for $49.95 or Tape for $39.95. Send original disk or tape. Include $3 S/H.

It's Word Processor Trade In Time

For a limited time you can trade in your old software for the VIP Writer I or III and save up to $20! Send in your old disk or tape and manual. VIP Writer tape $34.95, disk $49.95. VIP Writer III tape $44.95, disk $59.95. Include $3.00 shipping. Offer expires 8/31/88

VIP Database III

The VIP Database III features selectable screen displays of 40, 64 or 80 characters by 24 lines with choice of 64 foreground and background colors for maximum utility. It uses the CoCo 3's hardware screen and double clock speed to be the FASTEST database available! VIP Database III will handle as many records as will fit on your disks and is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design. All files are fully indexed for speed and efficiency. Full sort of records is provided for easy listing of names, figures, addresses,etc., in ascending or descending alphabetical or numeric order. Records can be searched for specific entries using multiple search criteria. With Database III mail-merge you may also combine files, sort and print mailing lists, print form letters, address envelopes - the list is endless. The built-in MATH package even performs arithmetic operations and updates other fields. VIP Database III also has a print spooler and report generator with unlimited print format capabilities including embeddable control codes for use with ALL printers. DISK $69.95

VIP Database owners: Upgrade to the VIP Database III Disk for $39.95. Send original disk. Include $3 shipping.

VIP Integrated Library

The VIP Integrated Library combines all six popular VIP application programs - VIP Writer*, Speller, Calc, Database*, Terminal and Disk-ZAP - into one program on one disk! The program is called VIP Desktop. From the desktop you have instant access to word processing with a spelling checker always in attendance, data management with mail merge, spreadsheet financial analysis, telecommunications and disk maintenance. 64K. required . Include $4.00 shipping for this product. DISK $149.95
*CoCo 3 owners: Purchase the VIP Integrated Library /WDE (Writer & Database Enhanced) which has the VIP Writer III and VIP Database III in place of the VIP Writer and VIP Database. Include $4.00 shipping for this product. DISK $169.95

Previous VIP Library owners: Call or write for upgrade pricing.

VIP Writer

VIP Writer is also available for CoCo 1 and 2 owners and has all the features found in the VIP Writer III including VIP Speller except for the following: The screen display is 32, 51, 64 or 85 columns by 21 or 24 rows. Screen colors are green, black or white. Help is not presented in colored windows. Double clock speed is not supported. Parallel printer interface is not supported. Print spooler is not available. Hard disk is not supported. Even so, VIP Writer still out-features the rest! It's a CoCo 1 or 2 owners best choice in word processors. Includes VIP Speller. DISK $69.95
Cassette version does not include VIP Speller. TAPE $49.95

VIP Speller

VIP Speller works with ANY ASCII file created by most popular word processors. It automatically checks text files for words to be corrected, marked for special attention or even added to the dictionary. You can even view the misspelled word in context! VIP Speller comes with a specially edited 50,000 word dictionary, and words can be added to or deleted from the dictionary or you can create your own. DISK $34.95

VIP Database

VIP Database has all the features of VIP Database III except the screen widths are 51, 64 and 85. Screen colors are green, black and white, double speed is not supported, spooler is not available. Still VIP Database is the best database for the CoCo 1 & 2! DISK $49.95

VIP Calc

Now every CoCo owner has access to a calculating and planning tool better than VisiCalc™, containing all its features and commands and then some. VIP Calc displays 32, 51, 64 or 85 characters by 21 or 24 lines right on the screen. VIP Calc allows up to a 33K worksheet with up to 512 columns by 1024 rows! In addition, VIP Calc has multiple windows which allow you to compare and contrast results of changes. Other features include 16 DIGIT PRECISION • trig. functions • averaging • algebraic functions • column and row ascending and descending SORTS • locate formulas or titles in cells • block move and replicate • global or local column width • limitless programmable functions • works with ANY printer. Embed printer control codes for customized printing. Combine spreadsheet data with VIP Writer documents to create ledgers, projections, statistical and financial budgets and reports. Requires 64K. DISK $59.95

VIP Terminal

For your important communications needs you've got to go beyond software that only lets you chat. You need a smart terminal so that you can send and receive programs and messages and print them! The VIP Terminal features 32, 51, 64 or 85 characters by 21 or 24 lines on the screen and has a 43K byte buffer to store information. DISK $39.95

VIP Disk-ZAP

VIP Disk-ZAP is the ultimate disk repair utility for simple and quick repair of most disk errors. Designed with the non-programmer in mind, the VIP Disk-ZAP will let you retrieve all types of bashed files, BASIC and Machine Language programs. It even works with 40 track drives! The 50 page tutorial makes the novice an expert. DISK $24.95

All disk products are unprotected and run under RSDOS.

SD ENTERPRISES

(503) 663-2865 POB 1233 Gresham, OR 97030

Please add $3 for shipping and handling. Outside continental US add $4 S/H. COD orders add an additional $2.25. Checks allow 3 weeks for delivery. All other orders are shipped the same day.

Telewriter 128 is a trademark of Cognitec. Word Power 3 is a trademark of Microcom Software.

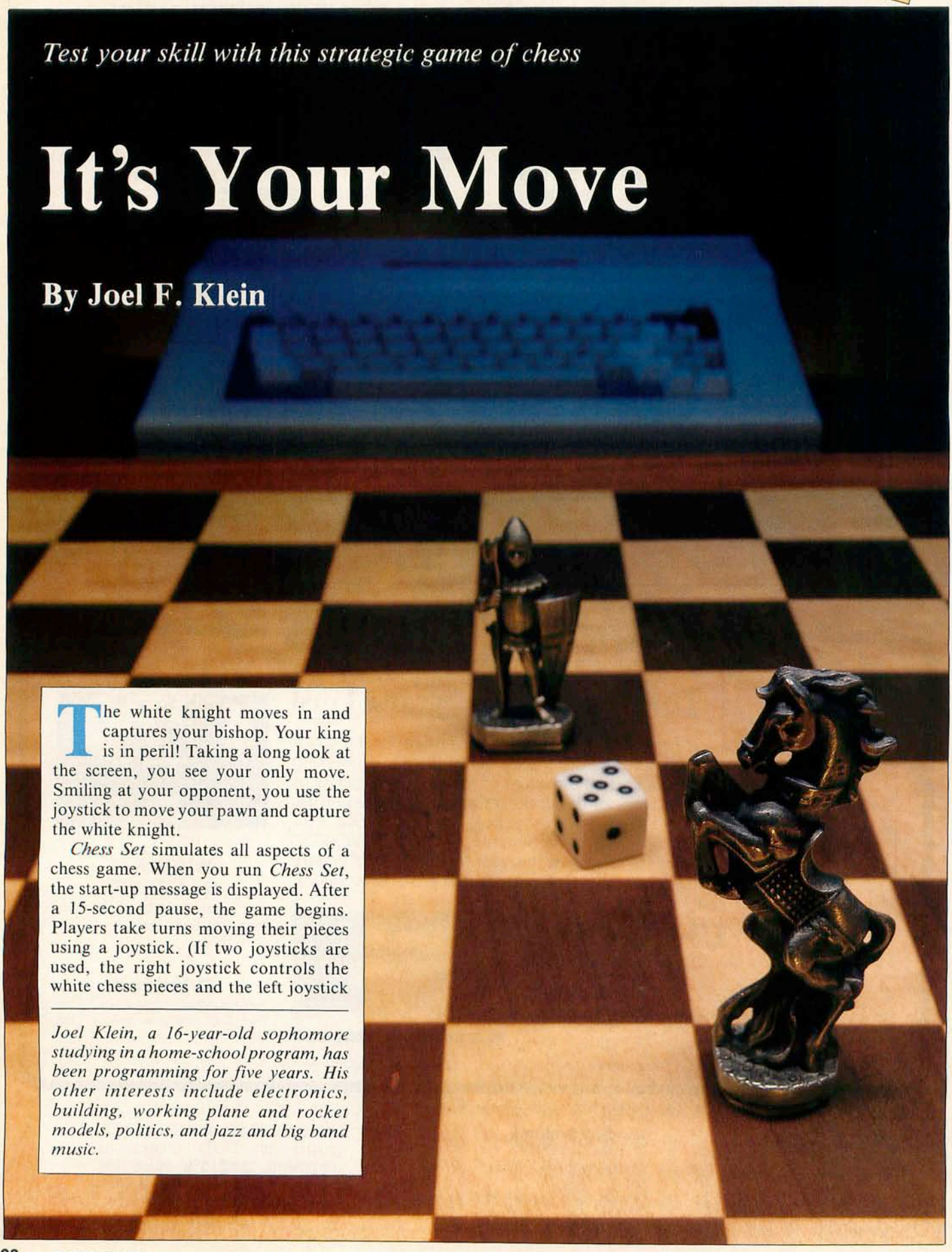
```
8ØØ IF PP=254 OR PP=126 THEN 81Ø
 ELSE 79Ø
81Ø CLS
82Ø DIM L(9,9)
83Ø DIM G$(12)
84Ø S(1)=5
85Ø S(2)=4
86Ø S(3)=3
87Ø S(4)=3
88Ø S(5)=2
89Ø G$(Ø)=CHR$(175)+CHR$(175)
9ØØ FOR X=1 TO 5
91Ø G$(X)=G$(Ø)
92Ø NEXT X
93Ø G$(6)="ac"
94Ø G$(7)="bs"
95Ø G$(8)="cr"
96Ø G$(9)="sb"
97Ø G$(1Ø)="de"
98Ø G$(11)=CHR$(2Ø7)+CHR$(2Ø7)
99Ø G$(12)=CHR$(191)+CHR$(191)
1ØØØ A$=STRING$(2Ø,175)
1Ø1Ø PRINT @ 1Ø3,"Ø 1 2 3 4 5 6
7 8 9"
1Ø2Ø FOR X=Ø TO 9
1Ø3Ø PRINT @ 134+X*32,RIGHT$(STR
$(X),1);A$;RIGHT$(STR$(X),1);
1Ø4Ø NEXT X
1Ø5Ø PRINT @ 455,"Ø 1 2 3 4 5 6
7 8 9"
1Ø6Ø PRINT @ 129,"ac-5";
1Ø7Ø PRINT @ 193,"bs-4";
1Ø8Ø PRINT @ 257,"cr-3";
1Ø9Ø PRINT @ 321,"sb-3";
11ØØ PRINT @ 385,"de-2";
111Ø A=RND(-TIMER)
112Ø FOR I=1 TO 5
113Ø A=RND(49)
114Ø FOR X=1 TO A
115Ø B=RND(2)
116Ø NEXT X
117Ø IF B=1 THEN 131Ø
118Ø V=RND(1Ø)-1
119Ø IF V>5 THEN V=V-5
12ØØ H=RND(1Ø)-1
121Ø FOR X=V TO V+S(I)-1
122Ø IF L(H,X)<>Ø THEN 113Ø
123Ø NEXT X
124Ø FOR X=V TO V+S(I)-1
125Ø L(H,X)=I
126Ø NEXT X
127Ø GOTO 14ØØ
128Ø L(X,H)=I
129Ø NEXT X
13ØØ GOTO 14ØØ
131Ø H=RND(1Ø)-1
132Ø IF H>5 THEN H=H-5
133Ø V=RND(1Ø)-1
134Ø FOR X=H TO H+S(I)-1
135Ø IF L(X,V)<>Ø THEN 113Ø
136Ø NEXT X
137Ø FOR X=H TO H+S(I)-1
138Ø L(X,V)=I
139Ø NEXT X
14ØØ NEXT I
141Ø OX=1Ø
142Ø OY=1Ø
143Ø PRINT @ 37,"SHOTS LEFT:";6Ø
-SH;" HITS:";HT
144Ø IF HT=17 THEN 2ØØØ
145Ø IF SH=6Ø THEN 2ØØØ
146Ø X=INT(JOYSTK(Ø)/7)
147Ø Y=INT(JOYSTK(1)/7)
148Ø PRINT @ 135+X*2+Y*32,G$(12)
;
149Ø IF OX=X THEN 152Ø
15ØØ PRINT @ 487+(X*2),"^";
151Ø PRINT @ 487+(OX*2)," ";
152Ø IF OY=Y THEN 155Ø
153Ø PRINT @ 156+(Y*32),"_";
154Ø PRINT @ 156+(OY*32)," ";
155Ø OY=Y
156Ø OX=X
157Ø PRINT @ 135+X*2+Y*32,G$(L(X
,Y));
158Ø PP=PEEK(6528Ø)
159Ø IF PP=254 OR PP=126 THEN 16
1Ø
16ØØ GOTO 146Ø
161Ø PRINT @ Ø
162Ø SH=SH+1
163Ø PLAY"O1L255V31"
164Ø FOR M=1 TO 31
165Ø PLAY"N1ØN3N5N4N2N6V-":NEXT
M
166Ø Z=135+X*2+Y*32
167Ø IF L(X,Y)=Ø THEN 197Ø
168Ø IF L(X,Y)=>6 THEN 143Ø
169Ø HT=HT+1
17ØØ C=L(X,Y)
171Ø ON C GOTO 172Ø,177Ø,182Ø,18
7Ø,192Ø,
172Ø PRINT @ Z,"ac";
173Ø L(X,Y)=6
174Ø HA=HA+1
175Ø IF HA=5 THEN PRINT @ 6,"ENE
MY CARRIER SUNK!" ELSE PRINT @ 4
, "ENEMY CARRIER HIT AT ";RIGHT$
(STR$(X),1);",";RIGHT$(STR$(Y),1
)
176Ø GOTO 143Ø
177Ø PRINT @ Z,"bs";
178Ø L(X,Y)=7
179Ø HB=HB+1
18ØØ IF HB=4 THEN PRINT @ 5,"ENE
MY BATTLESHIP SUNK!" ELSE PRINT
@ 2,"ENEMY BATTLESHIP HIT AT ";R
IGHT$(STR$(X),1);",";RIGHT$(STR$
(Y),1)
181Ø GOTO 143Ø
182Ø PRINT @ Z,"cr";
183Ø L(X,Y)=8
```

```
184Ø HC=HC+1
185Ø IF HC=3 THEN PRINT @ 7,"ENE
MY CRUISER SUNK!" ELSE PRINT @ 4
,"ENEMY CRUISER HIT AT ";RIGHT$(
STR$(X),1);",";RIGHT$(STR$(Y),1)
186Ø GOTO 143Ø
187Ø PRINT @ Z,"sb";
188Ø L(X,Y)=9
189Ø HD=HD+1
19ØØ IF HD=3 THEN PRINT @ 5,"ENE
MY SUBMARINE SUNK!" ELSE PRINT @
 3,"ENEMY SUBMARINE HIT AT ";RIG
HT$(STR$(X),1);",";RIGHT$(STR$(Y
),1)
191Ø GOTO 143Ø
192Ø PRINT @ Z,"de";
193Ø L(X,Y)=1Ø
194Ø HE=HE+1
195Ø IF HE=2 THEN PRINT @ 5,"ENE
MY DESTROYER SUNK!" ELSE PRINT @
 3,"ENEMY DESTROYER HIT AT ";RIG
HT$(STR$(X),1);",";RIGHT$(STR$(Y
),1)
196Ø GOTO 143Ø
197Ø PRINT @ Z,CHR$(2Ø7);CHR$(2Ø
7);
198Ø L(X,Y)=11
199Ø GOTO 143Ø
2ØØØ FOR Y=Ø TO 9
2Ø1Ø FOR X=Ø TO 9
2Ø2Ø IF L(X,Y)=Ø THEN L(X,Y)=11
2Ø3Ø IF L(X,Y)<6 THEN L(X,Y)=L(X
,Y)+5
2Ø4Ø PRINT @ 135+X*2+Y*32,G$(L(X
,Y));
2Ø5Ø NEXT X,Y
2Ø6Ø FOR X=1 TO 35ØØ
2Ø7Ø NEXT X
2Ø8Ø CLS
2Ø9Ø PRINT "SHOTS:";SH;" HITS:";
HT
21ØØ PRINT
211Ø PRINT "ON A SCALE OF 1 TO 1
Ø"
212Ø PRINT USING "YOU RATE A: ##
";(61-SH)/4.5+.5
213Ø PRINT @ 487,"PLAY AGAIN <Y/
N>";
214Ø FOR X=1 TO 1ØØØ
215Ø A$=INKEY$
216Ø PP=PEEK(6528Ø)
217Ø IF PP=254 OR PP=126 THEN CL
EAR:GOTO 81Ø
218Ø IF A$="Y" THEN CLEAR:GOTO 8
1Ø
219Ø IF A$="N" THEN CLS:END
22ØØ NEXT X
221Ø RUN
```

Test your skill with this strategic game of chess

It's Your Move

By Joel F. Klein



The white knight moves in and captures your bishop. Your king is in peril! Taking a long look at the screen, you see your only move. Smiling at your opponent, you use the joystick to move your pawn and capture the white knight.

Chess Set simulates all aspects of a chess game. When you run *Chess Set*, the start-up message is displayed. After a 15-second pause, the game begins. Players take turns moving their pieces using a joystick. (If two joysticks are used, the right joystick controls the white chess pieces and the left joystick

---

Joel Klein, a 16-year-old sophomore studying in a home-school program, has been programming for five years. His other interests include electronics, building, working plane and rocket models, politics, and jazz and big band music.

Telewriter-128™

the Color Computer 3 Word Processor

For over 5 years now, Telewriter has been the #1 Color Computer word processor, both in popularity and in performance. Telewriter's near perfect mix of sophisticated professional features and a very natural user interface, has earned it the highest praise in numerous magazines, and an intensely loyal following among tens of thousands of Color Computer users all over the world.

HISTORY

Throughout the history of the Color Computer, Telewriter has pioneered software breakthroughs that set the standards.

In 1981, it was Telewriter 1.0 that first took the Color Computer's inadequate 32X16 all-uppercase display, and replaced it with a graphics-based 51X24 upper and lowercase display.

A few years later, Telewriter-64 added high density 64X24 and 85X24 displays and access to the full 64K of the newer Color Computers.

THE NEW AGE

Today, Telewriter-64 is recognized as the standard Color Computer word processor. It runs on all Tandy Color Computers — from the original Color Computer 1, to the Color Computer 2, and 3.

But the Color Computer 3 brings a whole new level of power to low cost computing and, so, a new Telewriter is here to put that power to work for you. We call it Telewriter-128.

TELEWRITER-128

You don't mess with a good thing, so Telewriter-128 is still Telewriter-64 at heart. The commands, and the user interface are essentially the same. If you know Telewriter-64, then you already know Telewriter-128. And, if you don't know Telewriter-64, you'll still have an easy time learning and using Telewriter-128.

80 COLUMNS

But there are major differences as well. First, Telewriter-128 uses the Color Computer 3's new 80 column screen display.

This means, simply, that using Telewriter-128 on a low cost Color Computer 3 will look a lot like using a more expensive word processor on a much more expensive IBM PC, PS/2, or clone.

SPEED

Second, Telewriter-128 is lightning fast. Telewriter-64 was fast in its own right, but, by accessing the Color Computer 3's video hardware directly, and by running the machine in double speed mode, Telewriter-128 is able to provide extremely fast scrolling and instant paging — functions whose speed is crucial to serious word processing.

In this department, Telewriter-128 doesn't simply keep up with IBM-based word processors — it generally surpasses them!

EASE

Third, Telewriter-128 adds a host of new features big and small, that make it even easier to use.

Features like: Quick function key access to the editor or the menus — an instant on-line help screen summarizing all Telewriter commands and special characters — an option file where you store your personal set of format and screen settings so you only have to set them once!

Then, there's a quick save feature which allows you to save all your current work without leaving the editor. There's a simple way to cursor through the disk directory and read in a file by just hitting ENTER. And there's more.

NEW POWER

Telewriter-64 always had the power to handle any kind of serious writing, from letters to textbooks. But, here too, Telewriter-128 adds major features. Like Macros — which let you insert whole words or phrases (even sets of control codes or format commands) into your text, with a single keypress. And every time you power up Telewriter-128, the macro definitions are automatically loaded*, so they're always there.

Then there's a Print Preview feature that shows you, on-screen, the way your printed text will look — with margins, headers, centering, justification, page numbering, and page breaks. This guarantees letter perfect documents every time, and makes tasks like widow/orphan line elimination, a breeze.

TELEWRITER-64 OR TELEWRITER-128

We could go on listing features, but the point is this: If you own a Color Computer, you already have the hardware for the most powerful, low cost word processor in town. All you need now is to add the heart and soul:

Telewriter-64, for the Color Computer 1 and 2, costs $59.95 on disk, $49.95 on cassette.

Telewriter-128 for the Color Computer 3 costs $79.95 on disk, $69.95 on cassette.

To order by Mastercard or Visa call (619) 755-1258 anytime, or send check or money order plus $2 shipping (Californians add 6% sales tax) to:

COGNITEC
704 Nob Ave.
Del Mar, CA 92014

To upgrade from Telewriter-64 to Telewriter-128, return your original disk or cassette with $39.95. (Add $10 if you're also upgrading from cassette to disk. Deduct $10 with proof of Oct '87 - Feb '88, purchase of Telewriter-64.)

When I first got Telewriter-64 last year, I was in heaven. I couldn't believe the program's versatility and ease of use.
-The RAINBOW, Oct. 1985

TELEWRITER-64 FEATURES: Compatibility with any printer that works with the Color Computer; embedded control codes for underlining, boldface, sub/superscript, variable fonts; format commands for headers, centering, margin and spacing changes anywhere in the document; Format menu to set margins, spacing, page numbering, BAUD rate, lines per page, justification; Chain printing for one shot printing of multi-file documents. Fast, full-screen editor with wordwrap, block copy/move/delete, global search and replace, wild card search, fast 4-way auto-repeat cursor, fast scrolling, forward and backward paging, text alignment, tabs, error protection, word and line counter. Insert or delete text anywhere on the screen. Simple, easy to remember commands. Optional ASCII files for compatibility with spell checkers, terminal programs, and BASIC. Load, save, append, partial save files to disk or cassette. Kill, rename and list disk files. Cassette verify and auto-retry on error.

TELEWRITER-128 - ADDITIONAL FEATURES: Print preview from editor; multiple copy print; footers; hanging indents; cursor thru disk directory to load, append, rename and kill files; quick file save from editor; keyclick; key repeat; true block move; 24, 25, or 28 line screen; 40 or 80 column screen; dual speed cursor; on-line help; overstrike mode; word delete; wordwrap at margin; user definable macros; nested macros; instant status window for information on cursor position, word count, etc.; instant function key access to menus or editor; options menu for setting character and screen colors, key repeat and delay rates, definable foreign symbols.

RAINBOW CERTIFICATION SEAL

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T & D SUBSCRIPTION SOFTWARE CELEBRATES 6 YEARS

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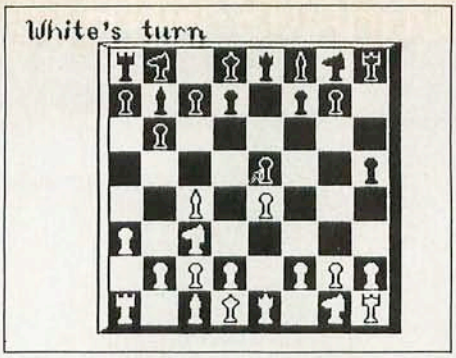
8	16	24	32	40	48	56	64	72

PLEASE CIRCLE
TAPE or DISK

controls the black pieces.) When a small arrow appears on the screen, you are in *input* mode. The arrow is then moved using the joystick to point to the desired square. Listed below are five play options, which can be used by pressing the corresponding key:

Q	Quit
R	Restarts a new game.
N	Next player
1	1 joystick
2	2 joysticks

The N command is extremely useful for correcting mistakes. For example, if you moved P-K4, intending a P-KB4, press N after the move is made. This will give control back to the same player. Simply move to the intended square, and no harm is done. (However, if you make an accidental capture, the captured piece *cannot* be recovered.) Castling can be accomplished the same way.



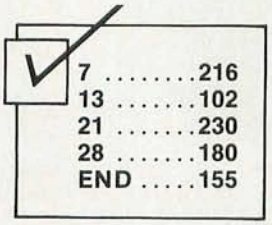
The only rule in *Chess Set* is that you must not move one of your pieces to a square containing another of your own pieces. After a moment's thought, you will realize this means you can make illegal moves. There are two reasons for this option: (1) You can make illegal moves with a real set, and (2) the processing time for determining a move's legality would be too long to be convenient.

To move a piece, point the arrow to the piece you want to move and press the fire button. Then, point to the square you want the piece moved to and press the fire button. Captures are sensed automatically, and captured pieces are taken from the board.

When a pawn reaches its eighth rank, you will be informed by a message on the text screen. Press any key and the board will again be displayed, this time with a rook, knight, bishop, and queen to the left of the board. Use the joystick to point to the piece desired, press the fire button, and the pawn is promoted.

When you wish to end the game, simply press Q to return to BASIC, or R to begin a new game. Enjoy the game, and remember to keep your king safe!

(Questions or comments regarding this program may be directed to the author at 4815 Marrison Place, Indianapolis, IN 46226. Please enclose an SASE when requesting a reply.) □

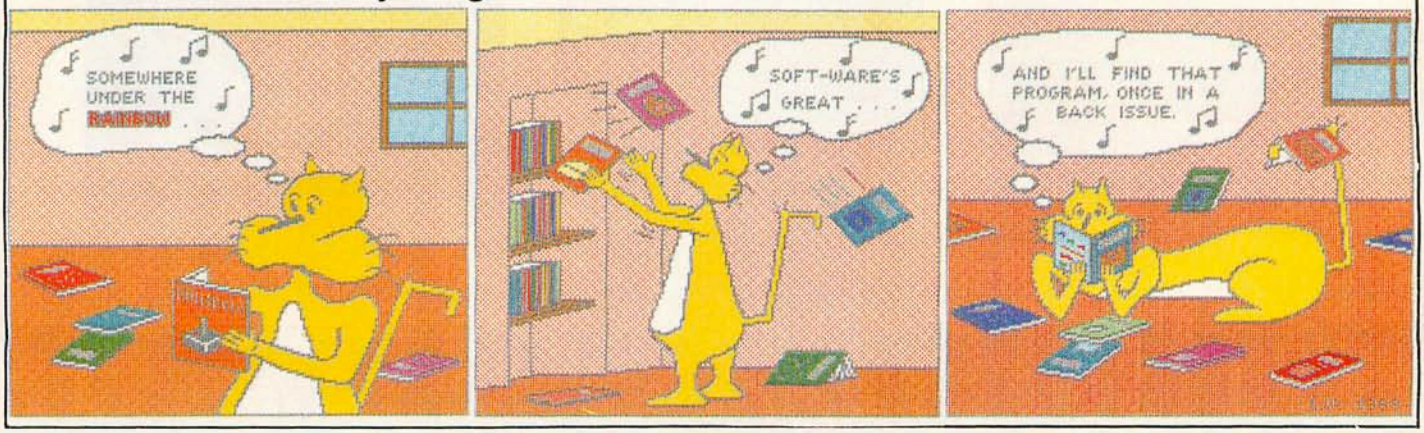


The listing: CHESS

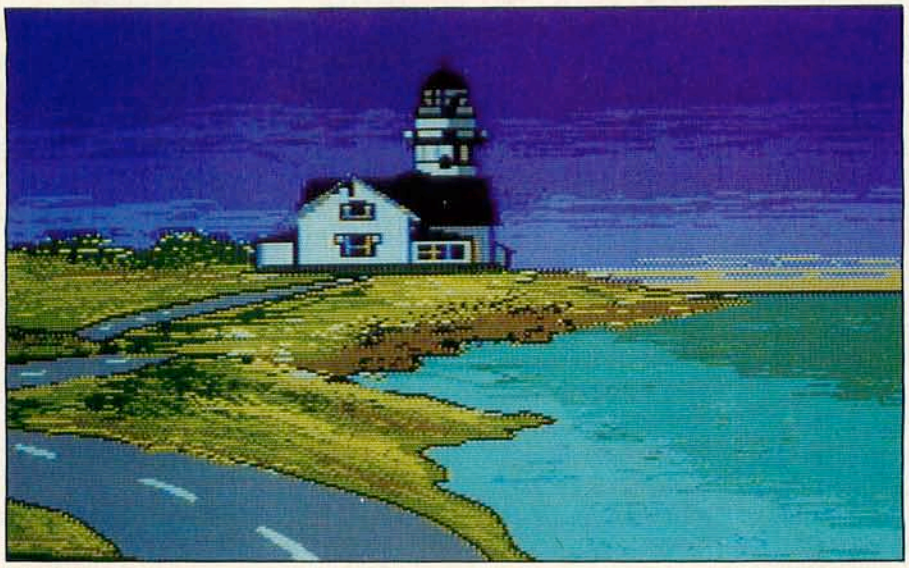
```
1 'CHESS SET
   BY JOEL F. KLEIN
16K ECB, 1 JOYSTICK REQUIRED
ADDRESS CORRESPONDANCE TO
K&R ELECTRONICS,4815 MARRISON
PL., INDPLS.,IN 46226
2 CLS:CLEAR255:PCLEAR4:PMODE4,1:
PCLS1:DIMA$(5),A(.,2),B(8,8),C(1
,15),BT(.,15),WT(.,15):D$="
   "
3 B$="CØBM4,ØG2DNG2D6GE2U7BR3D4N
RD3G2EU7ERERDRDRDLG2FRFLFLDLGL2B
R7EU7END7EBF4NRG2D2FNU3FERU4FD3F
BE5BR2LULGND3GD2FRDRE2BF2EU7E2GD
7UE2REBG3RDRDRD"
4 W$="CØBMØ,1ERD9FNU9RERNU5RDREU
7END7EBR3DGD8EU6D4E3RDRD4FU4BE4H
EDRBD4HD5GHRU4BEBR3NR5R2NU3D4FNU
9ED2E2BFBR7GL2ULULNU3ENR3U3R3DRD
2"
5 T$="CØBM7Ø,ØD9HU4NU3L2R5BD5NGN
LNHEBE2BU2ND5RD6RE3ND2U3RD6REBEB
U3ERD6EU4RURF2BEBRERD6RU5RURF2ND
3RD4REC1"
6 C$="CØBM189,7G3L4ULNU6HU5E3GFD
NGFEUNHEFREBF3D2F2HU4ERFD4NLRNU3
FBFBDEU6NHRD5ERE2UGU2LULBR5NR5R2
NUD4FNU7ED2E2BE3NUD4FNU6RE3ND2U3
RD6REBEBU3ERD6EU4RURF2BF3BR5GL2U
LU2NR3U2LND3ER3DRD2BF4DLUBU2U7RD
7"
7 PRINT@1Ø7,"CHESS  SET":PRINT:P
RINT:PRINTD$"BY JOEL F. KLEIN":P
RINT:PRINTD$"   MARCH 1988":PRIN
T:PRINT:PRINT:PRINT"     ONE MOM
ENT, PLEASE ..."
8 FORJ=.TO7:FORK=.TO7:A=-(A=.):C
OLORA:LINE(48+K*2Ø,16+J*2Ø)-(66+
K*2Ø,35+J*2Ø),PSET,BF:NEXT:A=-(A
=.):NEXT:DRAW"CØBM42,12R172NM-6,
+3D168L172U168M+6,+3R16ØD161L16Ø
NM-5,+4U162":PAINT(212,44),.,.
9 DRAW"C1":LINE(.,.)-(42,11),PSE
T,BF:DRAW"CØBM46,5ENH2U2LURBF3BD
5RDR2EULUL2ULUER2DR":DRAW"XB$;XT
$;":GET(.,.)-(42,1Ø),BT,G:LINE(.
,.)-(42,11),PSET,BF:DRAW"XW$;":G
ET(.,.)-(42,1Ø),WT,G
1Ø RESTORE:FORJ=.TO5:READA$(J):N
EXT:FORJ=.TO7:READB(J,.),B(J,1),
B(J,6),B(J,7):NEXT:FORJ=.TO7:FOR
K=2TO5:B(J,K)=12:NEXT:NEXT:FORJ=
.TO15:C(.,J)=48+J:C(1,J)=8*((J>7
)-(J<8))+J:NEXT:JN=1:BN=6528Ø
11 FORP=.TO1:FORPN=.TO15:GOSUB3Ø
:NEXT:NEXT:SCREEN1,.:SOUND2ØØ,2
12 'MAIN GAME LOOP
13 P=-(P=.):IFP=.THENPUT(.,.)-(4
2,1Ø),WT,PSETELSEPUT(.,.)-(42,1Ø
),BT,PSET
14 GOSUB26:IF(P+1)*6>B(X,Y)ANDP*
6-1<B(X,Y)THENSX=X:SY=Y:GOTO15EL
```

```
SESOUND1,3:GOTO14
15 GOSUB26:IFB(X,Y)>P*6-1ANDB(X,
Y)<P*6+6THENSOUND1,3:GOTO15 ELSE
 DX=X:DY=Y
16 PP=-(P=.):IFB(DX,DY)>PP*6-1AN
DB(X,Y)<PP*6+6THENDRAW"XC$;C1":P
LAY"T3V21L12O3CEGL8O4CL12O3AL4O4
C":LINE(18Ø,.)-(244,11),PSET,BF:
X=DX:Y=DY:PP=P:P=-(P=.):GOSUB31:
P=PP:C(-(P=.),PN)=72:B(DX,DY)=12
17 IFY+P=P*8ANDINT(B(SX,SY)/6)=B
(SX,SY)/6THEN2Ø
18 SOUND15Ø,1:C=-((INT(SX/2)=SX/
2)=(INT(SY/2)=SY/2)):COLORC:LINE
(49+SX*2Ø,16+SY*2Ø)-(66+SX*2Ø,35
+SY*2Ø),PSET,BF:C=-((INT(DX/2)=D
X/2)=(INT(DY/2)=DY/2)):COLORC:LI
NE(49+DX*2Ø,16+DY*2Ø)-(66+DX*2Ø,
35+DY*2Ø),PSET,BF
19 X=SX:Y=SY:GOSUB31:B(DX,DY)=B(
SX,SY):B(SX,SY)=12:C(P,PN)=DX+DY
*8:GOSUB3Ø:GOTO12
2Ø PLAY"T2V31O3L12DDDP32L2A":CLS
:PRINT@128,D$"  PAWN AT EIGHTH",
D$"RANK.YOU MAY NOW",D$"PROMOTE
 IT TO A",D$"PIECE  OF HIGHER",D
$"VALUE. PRESS ANY",D$"KEY TO DO
 SO.":GOSUB25:CLS:SCREEN1,.
21 FORJ=1TO4:X=2:Y=26+J*2Ø:DRAW"
BMØ,ØBR=X;BD=Y;CØXA$(J);":PAINT(
X+1Ø,Y+1Ø),-(P=.),.:NEXT
22 J=JOYSTK(.):J=INT(JOYSTK(-2*(
JN=2ANDP=1)+1)/16):H=2:V=46+J*2Ø
:IFPEEK(BN)=126ORPEEK(BN)=254ORP
EEK(BN)=253THEN24
23 GET(H,V+11)-(H+7,V+19),A,G:DR
AW"BMØ,ØBR=H;BD=V;BRBD18C1E3FEU2
EULGL2GFG3RCØE5GND2L2":PUT(H,V+1
1)-(H+7,V+19),A,PSET:IFPEEK(BN)=
126ORPEEK(BN)=254ORPEEK(BN)=253T
HEN24ELSE22
24 J=J+1:B(SX,SY)=J+P*6:DRAW"C1"
:LINE(.,26)-(21,126),PSET,BF:GOT
O18
25 K$=INKEY$:IFK$=""THEN25ELSERE
TURN
26 X=INT(JOYSTK(-2*(JN=2ANDP=1))
/8):Y=INT(JOYSTK(-2*(JN=2ANDP=1)
+1)/8)
27 H=48+X*2Ø:V=16+Y*2Ø:GET(H,V+1
1)-(H+7,V+19),A,G:DRAW"BMØ,ØBR=H
;BD=V;BRBD18C1E3FEU2EULGL2GFG3RC
ØE5GND2L2"
28 K$=INKEY$:IFK$=""THEN29ELSESO
UND1ØØ,1:IFK$="Q"THENCLS:ENDELSE
IFK$="N"THENPUT(H,V+11)-(H+7,V+1
9),A,PSET:GOTO13ELSEIFK$="R"THEN
7ELSEIFK$="1"THENJN=1ELSEIFK$="2
"THENJN=2ELSESOUND1,1:PUT(H,V+11
)-(H+7,V+19),A,PSET:GOTO27
29 IFPEEK(BN)=126ORPEEK(BN)=254O
RPEEK(BN)=253THENPUT(H,V+11)-(H+
7,V+19),A,PSET:SOUND1ØØ,1:RETURN
ELSEJ=X:K=Y:X=INT(JOYSTK(-2*(JN=
2ANDP=1))/8):Y=INT(JOYSTK(-2*(JN
=2ANDP=1)+1)/8):IFX=J ANDY=K THE
N28ELSEPUT(H,V+11)-(H+7,V+19),A,
PSET:GOTO27
3Ø PO=C(P,PN):Y=INT(PO/8):X=PO-Y
*8:NP=B(X,Y)+6*(P=1):C=-((INT(X/
2)=X/2)=(INT(Y/2)=Y/2)):C=-(C=.)
:X=48+X*2Ø:Y=16+Y*2Ø:DRAW"BMØ,ØB
R=X;BD=Y;C=C;XA$(NP);":PAINT(X+1
Ø,Y+1Ø),-(P=.),C:RETURN
31 FORJ=.TO15:IFX+Y*8=C(P,J)THEN
32ELSENEXT:STOP
32 PN=J:FORJ=.TO.:NEXT:RETURN
33 DATA BF6D2F2D5G2DR7UH2U5E2U2H
2L3G,BF2BR3D6R2FD6G2DR7UH2U6ER2U
6DGL2HULDGL2,BF5R2ER2E2FDFD6L2GD
3F2DL7UE2U5HL3HLUER
34 DATA BR9BD2DGDGD3FD5G2DR7UH2U
5EU3HUHU,BR9BD2DG2LGDF3D5G2DR7UH
2U5E3UHLH2U,BR9BD2DG2HD4F2D5G2DR
7UH2U5E2U4GH2U
35 DATA 7,6,Ø,1,8,6,Ø,2,9,6,Ø,3,
1Ø,6,Ø,4,11,6,Ø,5,9,6,Ø,3,8,6,Ø,
2,7,6,Ø,1
```

CoCo Cat by Logan Ward



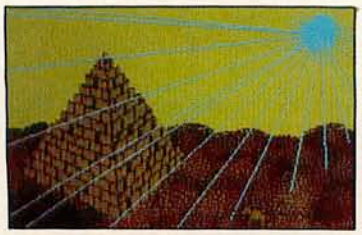
CoCo Gallery



Lighthouse **Brad Bansner**

Brad, a high school student in Wyomissing, Pennsylvania, used *Color Max Deluxe* to develop this beautiful scene.

Honorable Mention



Pyramid **Andrew Wright**

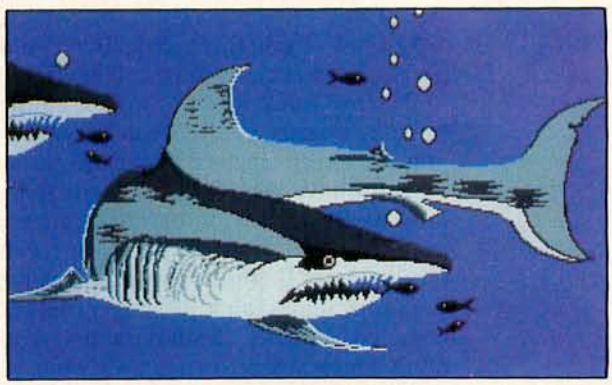
This graphic of an ancient Egyptian tomb was developed with *CoCo Max III*. Andrew lives in Conroe, Texas.

Owl **Wally Mayes**

Wally, of Hamilton, Ohio, used *CoCo Max III* to develop this view of the night bird. Some of his hobbies include archery and guitars.

Panther **Serge Beaudry**

This wild beast was generated with *CoCo Max II*. Serge lives in St-Polycarpe, Quebec, and enjoys many programs, such as *CoCo Max II* and *III*, *Lyra* and *Iron Forest*.



Sharks **Howard C. Rouse**

CoCo Max III was used to create these frightening marine creatures. Howard lives in Ocala, Florida.

SHOWCASE YOUR BEST! You are invited to nominate original work for inclusion in upcoming showings of "CoCo Gallery." Share your creations with the CoCo Community! Be sure to send a cover letter with your name, address and phone number, detailing how you created your picture (what programs you used, etc.) and how to display it. Also, please include a few facts about yourself.

Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere. A digitized copy of a picture that appears in a book or magazine is *not* an original work.

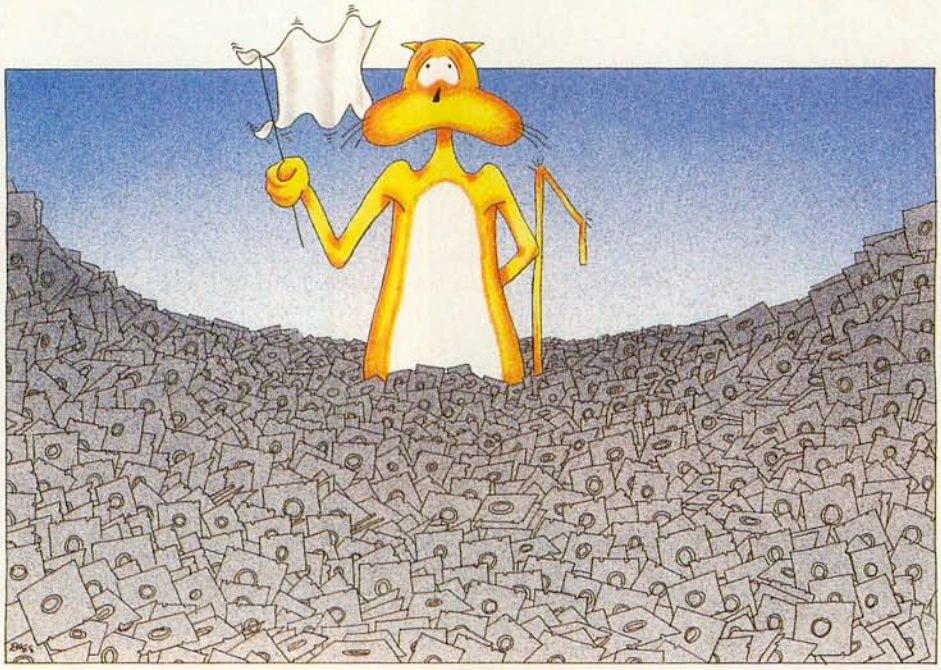
We will award two first prizes of $25, one for the CoCo 3 and one for the CoCo 1 and 2; one second prize of $15 and one third prize of $10. Honorable Mentions may also be given.

Please send your entry on either tape or disk to the CoCo Gallery, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. Remember, this is a contest and your entry will not be returned.

— Angela Kapfhammer, Curator

A program to help you compare disk files for duplicates

COCO TAKES A HINT



By Dennis H. Weide

You've got three disk drives and have been writing and keying in programs like crazy. With all the bulletin boards you've been accessing, you can't keep track of all the programs you now have. About 300 disks are lying around, filled with all sorts of duplicate programs. To confuse the issue even more, many different programs have the same names, and the same program is saved under different names. You don't know what to save and what to erase. Sound familiar? Well, it does to me, so I wrote a program that helps me determine which are duplicate files.

Filecomp is a machine language program that compares disk files much the same as the COMP command in the IBM PC and compatibles. It prompts you for two filenames, then reads the files to determine their size. If the files are not the same size, the size of each file will be reported on the screen and the program will end. If the files are the same size, the program compares them byte for byte, counts the number of mismatches between them, and reports the number of mismatches and the size of each file on the screen. If no mismatches are reported, then the file contents are identical.

To use the program, first protect the memory where the *Filecomp* program will load by keying in and entering CLEAR 200,&H4E20. Then type LOADM "FILECOMP", press ENTER, type EXEC and press ENTER again to load and execute *Filecomp*. Enter the names of the files to be compared at the prompts. The program can compare files on any drive, so you must include the drive number (0 through 3) in the filename even if you only have a one drive system.

Dennis Weide is a communications technician for AT&T in Albuquerque, New Mexico, where he programs AT&T and IBM PCs. He enjoys making toys and teaching computer programming.

The listing: FILECOMP

```
PROGRAM FILECOMP(INPUT,OUTPUT);

(* BY DENNIS H. WEIDE *)
(* COMPARE DISK FILES *)
(* TO VERIFY IF THEY  *)
(* ARE EXACT COPIES   *)

VAR FILE1,FILE2:TEXT;
    FILENAME1,FILENAME2:STRING;
    MISMATCH,SIZE1,SIZE2:INTEGER;
    FILECHAR1,FILECHAR2:CHAR;

PROCEDURE FILESIZE(VAR FILETOREAD:STRING;VAR FSIZE:INTEGER);

(* READ FILE SIZE *)

  VAR INFILE:TEXT;
      CHARACTER:CHAR;

  BEGIN
     FSIZE:=Ø;
     RESET(INFILE,FILETOREAD);
     WHILE NOT EOF(INFILE) DO BEGIN
        READ(INFILE,CHARACTER);
        FSIZE:=SUCC(FSIZE);
     END; (*WHILE*)
  END; (*PROC*)

(* MAIN PROGRAM *)

BEGIN
   SIZE1:=Ø;
   SIZE2:=Ø;
   MISMATCH:=Ø;
   PAGE;
   WRITE('ENTER FILE1 > ');
   READLN(FILENAME1);
   WRITE('ENTER FILE2 > ');
   READLN(FILENAME2);
   WRITELN;
   FILESIZE(FILENAME1,SIZE1);
   FILESIZE(FILENAME2,SIZE2);
   IF SIZE1=SIZE2 THEN BEGIN
     RESET(FILE1,FILENAME1);
     RESET(FILE2,FILENAME2);
     WHILE NOT EOF(FILE1) DO BEGIN
        READ(FILE1,FILECHAR1);
        READ(FILE2,FILECHAR2);
        IF FILECHAR1<>FILECHAR2 THEN MISMATCH:=SUCC(MISMATCH);
     END; (*WHILE*)
     IF MISMATCH=Ø THEN
        WRITELN('NO MISMATCHES');
     IF MISMATCH=1 THEN
        WRITELN(MISMATCH,' MISMATCH');
     IF MISMATCH>1 THEN
        WRITELN(MISMATCH,' MISMATCHES');
   END; (*IF*)
   WRITELN;
   WRITELN(FILENAME1,'  ',SIZE1,' BYTES');
   WRITELN(FILENAME2,'  ',SIZE2,' BYTES');
END.
```

Three examples follow, the first comparing the file on Drive 0 to one of the same name on Drive 2:

```
ENTER FILE1 > FILECOMP/BIN:0
ENTER FILE2 > FILECOMP/BIN:2
```

The next example compares two files, with the same name but different extensions, that reside on the same drive:

```
ENTER FILE1 > FILECOMP/BIN:0
ENTER FILE2 > FILECOMP/PAS:0
```

The final example compares two files with different names on different drives:

```
ENTER FILE1 > FILECOMP/BIN:3
ENTER FILE2 > OTHRFILE/BAS:0
```

The program can even compare the same file to itself on the same drive. This is a valid way to check file size.

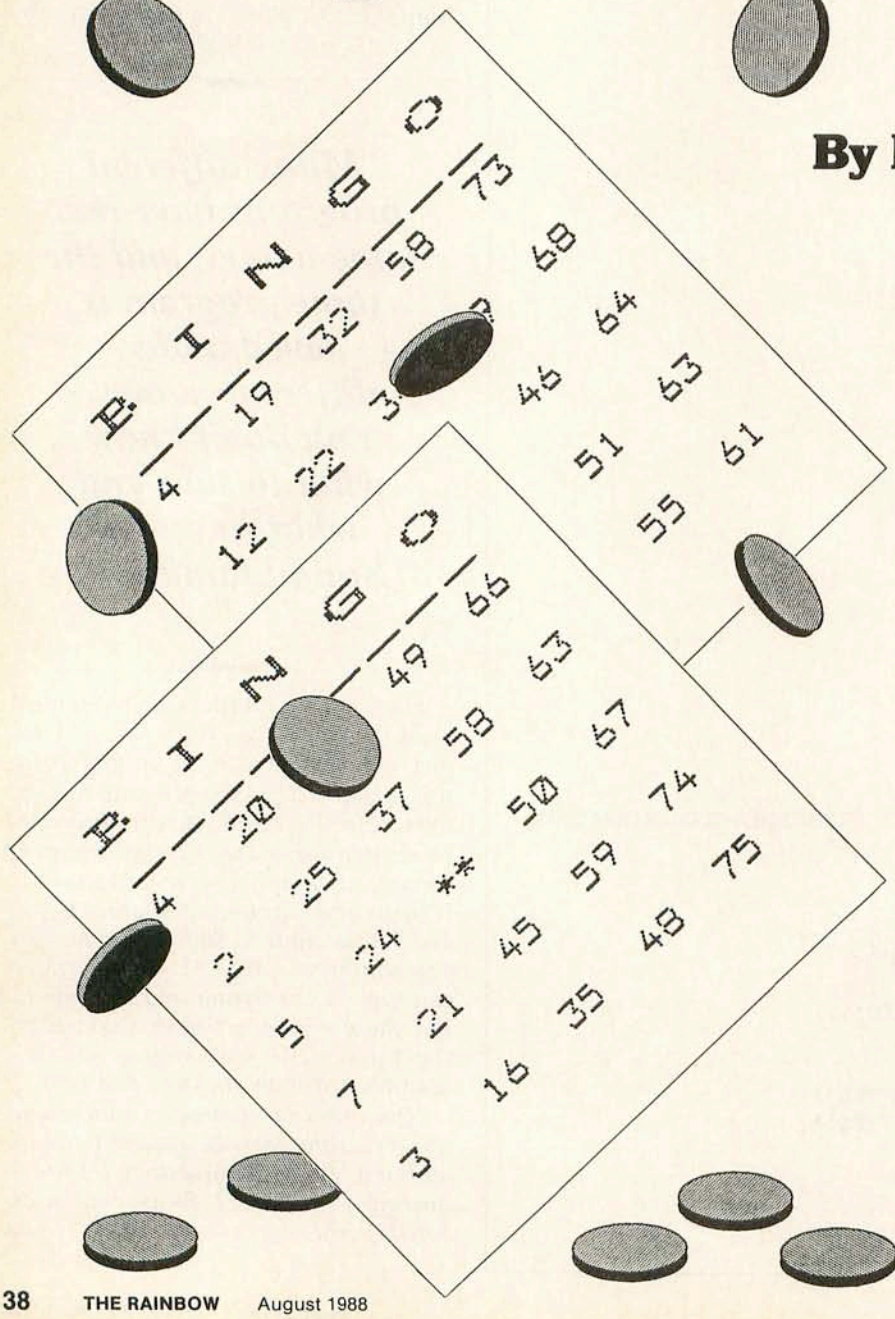
"Many different programs have the same names, and the same program is saved under different names. You don't know what to save and what to erase. Sound familiar?"

Filecomp was written and compiled using Deft PASCAL *Workbench*. Only one non-standard PASCAL statement was used (PAGE) in the program to clear the screen. Therefore, this program can be written using any PASCAL compiler capable of compiling standard PASCAL. It loads and executes at address $4E20 and ends at address $6099. For those of you who have a PASCAL compiler, you can type in the listing and compile it. For those who don't have a compiler, the binary file will appear on this month's RAINBOW ON TAPE and DISK.

(Questions or comments concerning this program may be directed to the author at 14201 Marquette N.E., Albuquerque, NM 877123. Please enclose an SASE when requesting a reply.)

An old favorite with some added bells and whistles

Bingo
the CoCo Way



By Bruce K. Bell, M.D.

One of my favorite things to do is to take traditional games and adapt them for use with my CoCo. Usually those adaptations include a few enhancements as well. That's what I've done with *Talking Bingo*.

Talking Bingo includes several advantages over a "store-bought" Bingo game or other computer Bingo games I've seen. For example, not only does CoCo select and display the Bingo numbers in bold colorful characters, but it also calls them out. You'll need a Tandy Speech/Sound Cartridge for this. It also constantly displays all the numbers that have been called during the current game. And you needn't go out and buy Bingo cards, because *Talking Bingo* will print out disposable cards for you. If you are alone on a rainy day, CoCo will challenge you to a few quick games. So let's get *Talking Bingo* up and running.

You'll need a CoCo 1, 2, or 3 with at least 16K of memory and Extended Color BASIC. The Tandy Speech/Sound Cartridge is optional, but it's needed if

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Bruce Bell is an optometric physician who spends hours using programs he finds in RAINBOW and programming his CoCo for home and office use.

you want the numbers called aloud. You'll need an 80-column printer if you want to print your own Bingo cards.

Once you've typed, debugged and saved the program you are ready to run it. On some older CoCos you may get an error after running; if so, just type RUN again.

At the initial menu you are given four choices:

1. Play Bingo
2. Computer Challenge
3. Print Bingo Cards
4. Exit to BASIC

Press the number corresponding to your choice. There may be a momentary delay after you press your choice and before the function is executed. Let's look at these one at a time.

Play Bingo

The screen will clear and the first randomly chosen number will appear in the center of the screen. Simultaneously the number will be called out. A second clock to the right of the screen clicks off ten seconds before the next number is chosen and displayed. After each number is displayed, it will appear in normal Color Computer characters on the screen. You may refer to these at any time during the game.

You've probably also noticed several items at the bottom of the screen. These are to remind you that you may at any time during the game press M to end the game and return to the menu, or press T to toggle between enabling and disabling the Speech/Sound Cartridge's speech capabilities. You may also press P to pause in the game. This is useful if you want to go back and compare your cards to those numbers already called. When you "Bingo," press B; you will be prompted to enter the five numbers you've used to do so. Press F if one of the numbers is the free space. Enter your numbers by typing the letter followed by the number: for example, B3 or O71. If you enter a number that has not been called, a series of question marks appear, requesting you to re-enter. Press M to end the game and return to the menu, or C to continue the same game where you left off.

After you've Bingoed and won the game, press M to return to the menu or C to continue where you left off. This allows you to have a second-place Bingo card.

Line Number	Description
000-010	Initialize program
100-120	Main Menu
200-250	Randomly select Bingo numbers
300-350	Input numbers for Bingo
400-480	CoCo creates and plays its cards
500-525	Print Bingo cards
600-620	Create Bingo cards
700	Ends game
800-855	Speech routine
900-945	Subroutines
1000-1070	Data
1100	Clears memory

Table 1

Computer Challenge

This option operates exactly the same as Play Bingo, except that CoCo also selects three cards and plays against you. Don't worry! CoCo won't cheat! After you have selected this option, there is a momentary pause while CoCo creates its three cards. Then the game begins, played as above with the following differences: When you select Menu,

Bingo, Pause, or Talk, there is a pause before the function is executed. This is because CoCo may be checking its cards when you press the key. CoCo doesn't forget; it just finishes checking its cards before carrying out your command.

When CoCo Bingos, its winning card appears in the center of the screen. Called numbers appear in reverse characters, and the winning row is marked in red. You may now return to the Menu and continue the same game or, by pressing V, see all three of CoCo's cards. This is the only time you may see them. Note that if CoCo has won the game and you choose to continue play, CoCo does not continue with you — it stops playing.

Print Bingo Cards

The cards created in *Talking Bingo* are printed on standard paper in four rows of three cards, or 12 cards per page. The idea is that each player plays with three cards at a time and marks with a pen or pencil the numbers on his cards as they are called. After selecting this option, you are asked for the number of rows of cards you want to print. Remember that there are four rows per page. Set the top edge of your paper at the print-head and follow the prompts from here.

I have a DMP 200 and CGP-220, both of which use CHR$(27)CHR$(14) to call expanded print and CHR$(27)CHR$(15) to recall normal print. If your printer is different, you will need to change lines 515 and 525 accordingly.

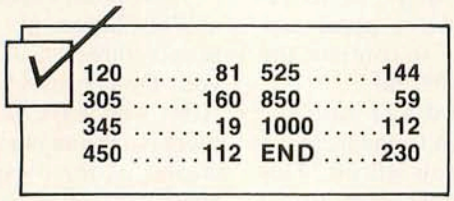
Exit to BASIC

This, of course, returns you to BASIC but does not erase the program from memory.

One final note about the Speech/Sound Cartridge. If you don't have one, no modifications are necessary. Just type in the program as it is and run it. You may, however, want to toggle the Talk function (by pressing T) to enable the alternate "beeps" that alert you when a new number appears.

I hope you enjoy playing and studying *Talking Bingo*. Table 1 includes a breakdown description of each of the program modules within the program. Let me know if I can be of any help.

(Questions or comments regarding this program may be addressed to the author at 137 Samanda Circle, Rockmart, GA 30153. Please enclose an SASE when requesting a reply.) □



120	81	525	144
305	160	850	59
345	19	1000	112
450	112	END	230

The listing: BINGOTLK

```
Ø 'BINGO 2.Ø; <C> BRUCE BELL 198
6,87; 16KECB; this program is no
nwarranted!!!
5 POKE3584,Ø:IFPEEK(33Ø21)=5ØTHE
NWIDTH32:POKE3584,2
1Ø FORK=1TO8:PRINT,"BINGO",,"bin
go",:NEXT:GOTO11ØØ
1ØØ POKE65495+PEEK(3584),Ø:PRINT
@Ø,CHR$(181)" ONE MOMENT "CHR$(1
86);:CLEAR55Ø:DIML$(14),N$(15),A
(75),B(2,4,5):R=RND(-TIMER):M1=&
HFFØØ:M2=&HFF7E:GOSUB92Ø:DEF FNL
(N)=INT(ABS(N-1)/15)+1
1Ø5 FORK=1TO14:FORX=1TO15:READD:
L$(K)=L$(K)+RIGHT$(STR$(D),2):NE
XTX,K:FORK=ØTO15:READN$(K):NEXT:
POKE65494+PEEK(3584),Ø
11Ø CLSØ:FORK=ØTO63:SET(K,2,4):S
ET(K,11,4):NEXT:R=32:L$="TALKING
 BINGO   BY BRUCE  BELLL":PRINT@
19,"by";CHR$(128)"bruce"CHR$(128
)"bell";:GOSUB85Ø:GOSUB9ØØ:FORK=
1TO75:A(K)=Ø:NEXT:Z=Ø:F=Ø
115 PRINT@224,TAB(6)"1. PLAY BIN
GO"TAB(38)"2. COMPUTER CHALLENGE
"TAB(38)"3. PRINT BINGO CARDS"TA
B(38)"4. EXIT TO BASIC":L$="WHAT
 IS YOUR PLEASURE?":PRINT@388,L$
;:GOSUB85Ø
12Ø GOSUB91Ø:CH=Q:ONQ GOTO2ØØ,4Ø
Ø,5ØØ,7ØØ:R=RND(7)*16:GOSUB9ØØ:G
OTO12Ø
2ØØ L$="GGET READY":GOSUB85Ø:CLS
Ø:L$="bingo":GOSUB915:GOSUB925
2Ø5 IFQ$="B"THEN3ØØELSEN=RND(75)
:IFA(N)>ØTHEN2Ø5ELSER=RND(6)*16:
L=FNL(N)
21Ø P=2ØØ:L$=L$(L):GOSUB9Ø5:R=R+
16:N$=RIGHT$(STR$(N),2)
215 FORK=1TOLEN(N$):X$=MID$(N$,K
,1):IFX$=" "THENL$=""ELSEL$=L$(V
AL(X$)+5)
22Ø P=2ØØ+6*K:GOSUB9Ø5:NEXTK
225 TIMER=Ø:TALK=1:IFT=ØGOSUB8ØØ
ELSESOUND1ØØ,1
23Ø IFCH=2THEN41Ø
235 GOSUB91Ø:GOSUB93Ø:IFDLAY=5AN
DTALK=1GOSUB8ØØ:TALK=Ø:GOTO235EL
SEIFDLAY THEN235
24Ø PRINT@Z,MID$("BINGO",L,1);RI
GHT$(STR$(N),2);CHR$(128);
245 A(N)=Z+3:Z=Z+4:IFZ=16ØTHENZ=
32Ø
25Ø GOTO2Ø5
3ØØ IFWV GOSUB465:GOTO33ØELSEPRI
NT@251,"bingo";:GOSUB945:PRINT@4
81," M=MENU   F=FREE   C=CONTINU
E ";
3Ø5 FORK=ØTO4:P=197+K*16:PRINT@P
,"";:INPUTQ$
31Ø PRINT@219+INT(K/2)*32,"bingo
";:IFQ$="M"THENK=5:NEXT:GOTO1ØØ
315 IFQ$="C"THENK=5:NEXT:GOSUB94
5:GOSUB925:F=Ø:FORK=1TO75:IFA(K)
>1ØØØTHENA(K)=A(K)-1ØØØ:PRINT@A(
K),CHR$(128);:NEXT:GOTO2Ø5ELSENE
XT:GOTO2Ø5
32Ø IFQ$="F"THENIFF=1THEN345ELSE
```

```
F=1:NEXTK:GOTO33Ø
325 N=VAL(MID$(Q$,2)):IFA(N)=ØOR
A(N)>1ØØØTHEN345ELSEPRINT@A(N),C
HR$(127);:A(N)=1ØØØ+A(N):IFT THE
NSOUND2ØØ,1:NEXTK ELSEL$="CHECK"
:GOSUB85Ø:NEXTK
33Ø PRINT@48Ø,STRING$(31,128);:P
RINT@48Ø,"GAME OVER! mENU cONTIN
UE";:L$="BINGO":GOSUB85Ø:IFCH=2T
HENPRINT" vERIFY";
335 GOSUB91Ø:L$="BINGO":GOSUB915
:L$="bingo":GOSUB915:IFQ$="C"THE
NPRINT@165,STRING$(22,128);:PRIN
T@293,STRING$(22,128);:CH=2-WV:W
V=Ø:FORK=3TO4:GOTO315ELSEIFCH=2
AND Q$="V"THENUU=U:FORU=ØTO2:GOS
UB465:PRINT@48Ø,"   CARD"U+1":
 PRESS <ENTER>    "; ELSE335
34Ø GOSUB91Ø:IFQ$=""THEN34ØELSEN
EXTU:U=UU:IFU=3GOSUB945:GOTO33ØE
LSEGOSUB465:GOTO33Ø
345 PRINT@P,"?????";:IFT THENSOU
ND1,5 ELSEL$="PLEASE RE ENTER":G
OSUB85Ø
35Ø K=K-1:NEXTK
4ØØ L$=" ONE MOMENT PLEASE... ":
PRINT@388,L$;:GOSUB85Ø:GOTO6ØØ
4Ø5 FORK=ØTO75:A(K)=Ø:NEXT:GOTO2
ØØ
41Ø FORK=ØTO2:FORC=ØTO4:FORR=ØTO
4:IFB(K,C,R)=N THENB(K,C,R)=B(K,
C,R)+5ØØ
415 GOSUB93Ø:IFDLAY=5ANDTALK=1GO
SUB8ØØ:TALK=Ø
42Ø NEXTR,C,K:GOSUB91Ø
425 WV=Ø:FORU=ØTO2:FORC=ØTO4:W=Ø
:V=Ø:FORR=ØTO4:IFB(U,C,R)>499THE
NW=W+1
43Ø IFB(U,R,C)>499THENV=V+1
435 NEXTR:GOSUB93Ø:IFW=5THENFORR
=ØTO4:B(U,C,R)=B(U,C,R)+5ØØ:NEXT
R:C=4:NEXTC:GOTO46ØELSEIFV=5THEN
FORR=ØTO4:B(U,R,C)=B(U,R,C)+5ØØ:
NEXTR:C=4:NEXTC:GOTO46ØELSENEXTC
44Ø R=4:W=Ø:V=Ø:FORC=ØTO4:IFB(U,
C,C)>499THENW=W+1
445 IFB(U,C,R)>499THENV=V+1
45Ø R=R-1:NEXTC:GOSUB93Ø:IFW=5TH
ENFORC=ØTO4:B(U,C,C)=B(U,C,C)+5Ø
Ø:NEXTC:GOTO46ØELSEIFV=5THENR=4:
FORC=ØTO4:B(U,C,R)=B(U,C,R)+5ØØ:
R=R-1:NEXTC:GOTO46Ø
455 NEXTU:GOTO235
46Ø WV=5:Q$="B":GOTO24Ø
465 GOSUB945:FORP=165TO293STEP32
:PRINT@P,CHR$(165)STRING$(2Ø,32)
CHR$(17Ø);:NEXT:FORR=ØTO4:P=166+
R*32:FORC=ØTO4:IFB(U,C,R)>999THE
```

Mouse Tales

By Logan Ward

```
NB=B(U,C,R)-1ØØØ:D=2ELSEIFB(U,C,
R)>499THENB=B(U,C,R)-5ØØ:D=1ELSE
B=B(U,C,R):D=Ø
47Ø IFD=ØTHENB$="BINGO"ELSEB$="b
ingo":IFD=2THENPRINT@P,CHR$(186)
;:IFB THENPRINT@A(B),CHR$(127);
475 IFB=ØTHENPRINT@P+1,"fre";ELS
EPRINT@P+1,USINGMID$(B$,FNL(B),1
)+"##";B;:IFD THENFORK=1TO2:POKE
1Ø25+P+K,PEEK(1Ø25+P+K)-64:NEXT
48Ø P=P+4:NEXTC,R:RETURN
5ØØ PRINT@386,"HOW MANY ROWS OF
CARDS";:INPUTQ
5Ø5 PRINT@416,"PREPARE PRINTER A
ND PRESS enter";:INPUTQ$:IF(PEEK
(65314)AND1)=1THENPRINT@416,"PRI
NTER IS NOT READY!!!":SOUND1ØØ,1
:FORZ=1TO1ØØØ:NEXT:GOTO5Ø5
51Ø FORZ=1TOQ:PRINT#-2:PRINT#-2:
FORK=1TO75:A(K)=Ø:NEXTK
515 PRINT#-2,CHR$(27)CHR$(14);:'
call expanded print mode (DMP2ØØ
)
52Ø FORK=1TO3:PRINT#-2,"  B I N
G O  ";:NEXT:PRINT#-2
525 FORK=1TO3:PRINT#-2,"
___  ";:NEXT:PRINT#-2,CHR$(27)CH
R$(15):'cancel expanded print mo
de (DMP2ØØ)
6ØØ FORR=ØTO4:FORK=ØTO2:FORC=ØTO
4
6Ø5 N=RND(15)+15*C:X=2^K:IF(A(N)
ANDX)<>Ø THEN6Ø5ELSEA(N)=(A(N)OR
X):IFR=2ANDC=2THENIFCH=2THENB(K,
C,R)=5ØØ:NEXTC ELSEPRINT#-2,TAB(
K*26+12)"**";:NEXTC
61Ø IFCH=2THENB(K,C,R)=N:NEXTC,K
,R:GOTO4Ø5ELSEPRINT#-2,TAB(K*26+
C*4+3)N;:NEXTC,K:PRINT#-2:PRINT#
-2:NEXTR
615 PRINT#-2:PRINT#-2:IFZ/4=INT(
Z/4)THENPRINT#-2:PRINT#-2
62Ø NEXTZ:GOTO1ØØ
7ØØ CLSRND(8):L$="SO LONG!":PRIN
TL$:GOSUB85Ø:END
8ØØ L$=MID$("BINGO",L,1)+" ":IFN
<1ØTHENL$=L$+STR$(N)ELSEIFN<21TH
ENL$=L$+N$(N-1Ø)ELSEIFN/1Ø=INT(N
/1Ø)THENL$=L$+N$(N/1Ø+8)ELSEL$=L
$+N$(INT(N/1Ø)+8)+RIGHT$(STR$(N)
,1)
85Ø IFT THENRETURNELSEL$=L$+" "+
CHR$(13):FORY=1TOLEN(L$)
855 IFPEEK(M2) AND 128=Ø THEN855
ELSEPOKEM2,ASC(MID$(L$,Y,1)):NEX
T
86Ø RETURN
9ØØ FORA=1TO5:P=59+6*A:L$=L$(A):
GOSUB9Ø5:NEXTA:RETURN
9Ø5 FORB=1TO21STEP1Ø:PRINT@P,"";
:FORC=ØTO9STEP2:PRINTCHR$(R+128+
VAL(MID$(L$,B+C,2)));:NEXTC:P=P+
32:NEXTB:RETURN
91Ø Q$=INKEY$:IFQ$="M"THEN1ØØ EL
SEIFQ$="T"THENT=(T+1)AND1:PRINT@
5Ø7,CHR$(84+T*32);:GOSUB92Ø:RETU
RNELSEIFQ$="P"THEN935ELSEIFQ$<>"
B"THENQ=VAL(Q$):RETURNELSEIFCH T
HEN24ØELSERETURN
915 FORK=ØTO2:PRINT@192+K*32,L$;
:PRINT@219+K*32,L$;:NEXT:RETURN
92Ø POKE&HFF7D,1:POKE&HFF7D,Ø:PO
KEM1+1,52:POKEM1+3,63:POKEM1+35,
6Ø:RETURN
925 PRINT@48Ø,CHR$(128);"Menu";S
TRING$(4,128);"Bingo";STRING$(4,
128);"Pause";STRING$(4,128);"Tal
k";:IFT THENPRINT@5Ø7,"t";:RETUR
NELSERETURN
93Ø DLAY=1Ø-INT(TIMER/6Ø):PRINT@
251,RIGHT$(STR$(DLAY),2)"SEC";:R
ETURN
935 TI=TIMER:PRINT@481,"   PRESS
 ANY KEY TO CONTINUE  ";
94Ø IFINKEY$=""THEN94ØELSETIMER=
TI:GOTO925
945 FORK=197TO261STEP32:PRINT@K,
STRING$(22,128);:NEXT:RETURN
1ØØØ DATA15,12,12,15,Ø,15,12,12,
12,15,15,3,3,3,15
1ØØ5 DATA4,12,15,12,8,Ø,Ø,15,Ø,Ø
,1,3,15,3,2
1Ø1Ø DATA15,9,Ø,Ø,15,15,Ø,9,Ø,15
,15,Ø,Ø,9,15
1Ø15 DATA15,12,12,12,8,15,Ø,1,3,
3,15,3,3,3,7
1Ø2Ø DATA15,12,12,12,15,15,Ø,Ø,Ø
,15,15,3,3,3,15
1Ø25 DATAØ,1,15,Ø,Ø,Ø,Ø,15,Ø,Ø,Ø
,3,15,3,Ø
1Ø3Ø DATAØ,4,12,12,15,15,12,12,1
2,12,15,3,3,3,3
1Ø35 DATA12,12,12,15,Ø,Ø,4,12,12
,15,3,3,3,3,15
1Ø4Ø DATA15,Ø,Ø,15,Ø,12,12,12,15
,12,Ø,Ø,Ø,15,Ø
1Ø45 DATA15,12,12,Ø,Ø,12,12,12,1
2,15,3,3,3,3,15
1Ø5Ø DATA15,12,12,Ø,Ø,15,12,12,1
2,15,15,3,3,3,15
1Ø55 DATAØ,12,12,12,1Ø,Ø,Ø,Ø,6,Ø
,Ø,Ø,6,Ø,Ø
1Ø6Ø DATAØ,15,12,15,Ø,15,12,12,1
2,15,15,3,3,3,15
1Ø65 DATA15,12,12,12,15,12,12,12
,12,15,Ø,Ø,Ø,Ø,15
1Ø7Ø DATATENN,EELLEVEN,TWELLVE,T
HHIRTEEN,FORTEEN,FFIFTEEN,SSIXTE
EN,SSEVENTEEN,EIGHT TEEN,NINE TE
EN,TWENTEE,THIRTEE,FORTEE,FIFTEE
,SSIXTEE,SSEVENTEE
11ØØ PCLEAR1:GOTO1ØØ
```

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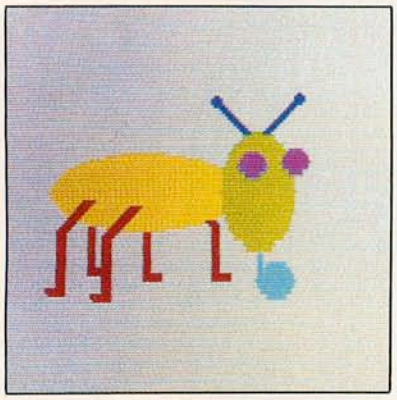
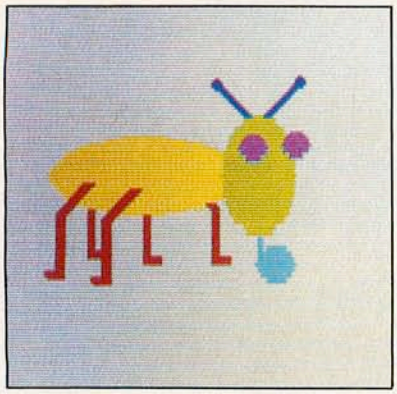




You won't even lose any pieces

Child's Play

By Bill Bernico

I remember, as a kid, playing a dice game where the players each got 13 plastic bug parts and shook a die, trying to assemble their own bug first. The problem with that game was that someone kept losing the plastic bug parts, and there never seemed to be enough legs or feelers to go around. When playing *Buggie*, the computer can't lose the pieces. They're always there, safe in CoCo's memory, ready to play.

I should explain the value of the die for you *Buggie* novices. Rolling a one gets you a body. Two is good for a head. Roll a three for eyes (you need two). A four gives you a feeler (again, you need two). Rolling a five allows you to add the tongue. You will need to roll a six a total of 6 times, one for each leg that you will add to your bug. There are 13 parts in all. Once you have all 13, you win. To "roll" the die, simply press any key when your name appears at the top of the screen. It sounds easy — too easy.

Here is the catch.

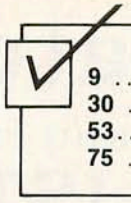
If you roll a one, you can begin with the body. No other number on the die has any value until a one is rolled. After all, you can't add a head, eyes, feelers, legs or a tongue unless you first have a body to put them on.

Once you have rolled a one, you can get credit for any sixes you roll, adding a leg for each six. Numbers three, four and five are still worthless until you roll a two, which will give you the bug's head. Three, four and five represent eyes, feelers and tongue, in that order. You can't add them unless you first have a head, can you?

All right, so now you have a body (one) and a head (two). From this point, any other number, in any order, will add to your bug. If you roll a number you don't need or can't use, simply pass the die and let the next player try for another piece. That's all there is to it. Have fun!

(Questions or comments concerning this program may be directed to the author at 708 Michigan Avenue, Sheboygan, WI 53081. Please enclose an SASE when requesting a reply.) □

Bill Bernico is the author of over 200 Color Computer programs and is a frequent RAINBOW contributor whose hobbies include golf, writing music and programming. Bill is a drummer in a rock band and lives in Sheboygan, Wisconsin.



9	191	98	234
30	95	110	157
53	0	120	68
75	25	END	102

The listing: BUGGIE

```
1 'COCO BUGGIE (C) 1988 FROM
   BILL BERNICO SOFTWARE

2 CLEAR5ØØ:CLSØ:PRINTTAB(1Ø)"COC
O-BUGGIE":FORX=1Ø24TO1Ø55:POKEX,
PEEK(X)-64:NEXTX:PRINT:PRINT"PLA
YER'S NAME MUST BE LESS THAN EIG
HT CHARACTERS EACH":PRINT:INPUT"
PLAYER 1'S NAME";N1$:IFLEN(N1$)>
8THEN2
3 PRINT@192,STRING$(32,143):PRIN
T@224,STRING$(32,143):PRINT@224,
"";:INPUT"PLAYER 2'S NAME";N2$:I
FLEN(N2$)>8THEN3
4 POKE65497,Ø:RGB:HSCREEN2:HCLS4
:HCOLOR8,4:ONBRKGOTO131:DT$="RDL
U2R2D3L3U3F":D$="BL4BUR22D22L22U
22E4R22NG4D22NG4U22L22G4BF3":LR$
="G1ØD2ØL4DR5U21E1ØRG1ØD2ØL5DNR6
DR6U22E1ØRG1Ø
5 HCLS4:HLINE(Ø,Ø)-(16Ø,191),PSE
T,B:HLINE(5,5)-(155,186),PSET,B:
HPAINT(2,2),2,8:HLINE(16Ø,Ø)-(31
9,191),PSET,B:HLINE(165,5)-(314,
186),PSET,B:HPAINT(167,2),3,8
6 IFP2=13THEN1ØØELSEGOSUB113:D=R
ND(6):HCOLOR2:PLAY"O2T2ØB":HPRIN
T(1,1),N1$+",HIT A KEY":EXEC4453
9:HDRAW"BM3Ø,27"+D$:Z=D:GOSUB1Ø6
:PLAY"O4T6ØCBDAEGFC
7 ON Z GOTO 8,12,18,26,34,4Ø
8 HPRINT(1Ø,4),"1=BODY
9 IFB1=1THEN11
1Ø IFB1=ØTHEN X=87:Y=93:H=6Ø:GOS
UB114:B1=1:P1=P1+1:GOTO52
11 GOSUB127:GOTO52
12 HPRINT(1Ø,4),"2=HEAD
13 IFH1=1THEN16
14 IFB1=ØTHEN17
15 IFH1=ØTHEN H=1ØØ:GOSUB115:H1=
1:P1=P1+1:GOTO52
16 GOSUB127:GOTO52
17 HPRINT(3,21),"YOU NEED A BODY
":GOTO52
18 HPRINT(1Ø,4),"3=EYES
19 IFH1=ØTHEN24
2Ø IFE1=2THEN25
21 IFE1=ØTHEN H=113:GOSUB116
22 IFE1=1THEN H=98:GOSUB117:P1=P
1+2
```

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by Bill Brady

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```
23 E1=E1+1:GOTO52
24 HPRINT(3,21),"YOU NEED A HEAD
":GOTO52
25 GOSUB127:GOTO52
26 HPRINT(1Ø,4),"4=FEELERS
27 IFH1=ØTHEN33
28 IFF1=2THEN32
29 IFF1=ØTHEN H=95:GOSUB118
3Ø IFF1=1THEN H=1Ø2:GOSUB119:P1=
P1+2
31 F1=F1+1:GOTO52
32 GOSUB127:GOTO52
33 HPRINT(3,21),"YOU NEED A HEAD
":GOTO52
34 HPRINT(1Ø,4),"5=TONGUE
35 IFH1=ØTHEN38
36 IFT1=1THEN39
37 IFT1=ØTHENX=1ØØ:H=1Ø6:GOSUB12
Ø:T1=1:P1=P1+1:GOTO52
38 HPRINT(3,21),"YOU NEED A HEAD
":GOTO52
39 GOSUB127:GOTO52
4Ø HPRINT(1Ø,4),"6=LEGS
41 IFB1=ØTHEN51
42 IFL1=6THEN5Ø
43 IFL1=ØTHEN H=85:GOSUB121
44 IFL1=1THEN H=62:GOSUB122
45 IFL1=2THEN H=42:GOSUB123
46 IFL1=3THEN H=38:GOSUB124
47 IFL1=4THEN H=55:GOSUB125
48 IFL1=5THEN H=77:GOSUB126:P1=P
1+6
49 L1=L1+1:GOTO52
5Ø GOSUB128:GOTO52
51 HPRINT(3,21),"YOU NEED A BODY
52 FORX=1TO15ØØ:NEXTX:IFP1=13THE
N99ELSEGOSUB113:F=RND(6):HCOLOR3
:PLAY"O3T2ØB":HPRINT(21,1),N2$+"
,HIT A KEY":EXEC44539:HDRAW"BM19
Ø,27"+D$:Z=F:GOSUB1Ø6:PLAY"O4T6Ø
CBDAEGFC
53 ON Z GOTO 54,58,64,72,8Ø,86
54 HPRINT(3Ø,4),"1=BODY
55 IFB2=1THEN57
56 IFB2=ØTHEN X=247:Y=93:H=22Ø:G
OSUB114:B2=1:P2=P2+1:GOTO98
57 GOSUB129:GOTO98
58 HPRINT(3Ø,4),"2=HEAD
59 IFH2=1THEN62
6Ø IFB2=ØTHEN63
61 IFH2=ØTHEN H=26Ø:GOSUB115:H2=
1:P2=P2+1:GOTO98
62 GOSUB129:GOTO98
63 HPRINT(23,21),"YOU NEED A BOD
Y":GOTO98
64 HPRINT(3Ø,4),"3=EYES
65 IFH2=ØTHEN7Ø
66 IFE2=2THEN71
67 IFE2=ØTHEN H=273:GOSUB116
68 IFE2=1THEN H=258:GOSUB117:P2=
P2+2
69 E2=E2+1:GOTO98
7Ø HPRINT(23,21),"YOU NEED A HEA
D":GOTO98
71 GOSUB129:GOTO98
72 HPRINT(3Ø,4),"4=FEELERS
73 IFH2=ØTHEN79
74 IFF2=2THEN78
75 IFF2=ØTHEN H=255:GOSUB118
76 IFF2=1THEN H=262:GOSUB119:P2=
P2+2
77 F2=F2+1:GOTO98
78 GOSUB129:GOTO98
79 HPRINT(23,21),"YOU NEED A HEA
D":GOTO98
8Ø HPRINT(3Ø,4),"5=TONGUE
81 IFH2=ØTHEN84
82 IFT2=1THEN85
83 X=26Ø:H=266:GOSUB12Ø:T2=1:P2=
P2+1:GOTO98
84 HPRINT(23,21),"YOU NEED A HEA
D":GOTO98
85 GOSUB129:GOTO98
86 HPRINT(3Ø,4),"6=LEGS
87 IFB2=ØTHEN97
88 IFL2=6THEN96
89 IFL2=ØTHEN H=245:GOSUB121
9Ø IFL2=1THEN H=222:GOSUB122
91 IFL2=2THEN H=2Ø2:GOSUB123
92 IFL2=3THEN H=198:GOSUB124
93 IFL2=4THEN H=215:GOSUB125
94 IFL2=5THEN H=237:GOSUB126:P2=
P2+6
95 L2=L2+1:GOTO98
96 GOSUB13Ø:GOTO98
97 HPRINT(23,21),"YOU NEED A BOD
Y
98 GOTO6
99 GOSUB113:HPRINT(3,21),"THE WI
NNER!":PLAY"O1T6ØCDEFGABO2CDEFGA
BO3CDEFGABO4CDEFGABO5CDEFGAB":FO
RG=1TO2ØØØ:NEXTG:GOTO1Ø1
1ØØ GOSUB113:HPRINT(23,21),"THE
WINNER!":PLAY"O1T6ØCDEFGABO2CDEF
GABO3CDEFGABO4CDEFGABO5CDEFGAB":
FORG=1TO2ØØØ:NEXTG:GOTO1Ø1
1Ø1 HCOLOR6:HLINE(11Ø,75)-(21Ø,1
2Ø),PRESET,BF:HLINE(11Ø,75)-(21Ø
,12Ø),PSET,B:HLINE(115,8Ø)-(2Ø5,
115),PSET,B:HPAINT(112,77),6,6:H
PRINT(15,11),"PLAY AGAIN":HPRINT
(17,13),"(Y/N)?
1Ø2 I$=INKEY$:IFI$=""THEN1Ø2
1Ø3 IFI$="Y"THENRUN
1Ø4 IFI$="N"THEN131
1Ø5 GOTO1Ø2
1Ø6 IF Z=1THENHDRAW"BR7BD8"+DT$
1Ø7 IF Z=2THENHDRAW"BR2BD2"+DT$+
"BR1ØBD12"+DT$
1Ø8 IF Z=3THENHDRAW"BR2BD2"+DT$+
"BR5BD6"+DT$+"BR5BD6"+DT$
1Ø9 IF Z=4THENHDRAW"BR2BD2"+DT$+
```

```
"BR1ØBD12"+DT$+"BU12"+DT$+"BD12B
L1Ø"+DT$
11Ø IF Z=5THENHDRAW"BR2BD2"+DT$+
"BR1ØBD12"+DT$+"BU12"+DT$+"BD12B
L1Ø"+DT$+"BU6BR5"+DT$
111 IFZ=6THENHDRAW"BR2BD2"+DT$+"
BD6"+DT$+"BD6"+DT$+"BR1Ø"+DT$+"B
U6"+DT$+"BU6"+DT$
112 RETURN
113 HLINE(6,6)-(15Ø,48),PRESET,B
F:HLINE(166,6)-(31Ø,48),PRESET,B
F:HLINE(9,165)-(15Ø,175),PRESET,
BF:HLINE(169,165)-(31Ø,175),PRES
ET,BF:RETURN
114 HCOLOR1:HCIRCLE(H,1ØØ),35,,.
4,.11,.9:HDRAW"BM"+STR$(X)+","+S
TR$(Y)+"D15":HPAINT(H,1ØØ),1,1:R
ETURN
115 HCOLORØ:HCIRCLE(H,1ØØ),13,,1
.7:HPAINT(H,1ØØ),Ø,Ø:RETURN
116 HCOLOR6:HCIRCLE(H,9Ø),5:HPAI
NT(H,9Ø),6,6:RETURN
117 HCOLOR6:HCIRCLE(H,91),5:HPAI
NT(H,91),6,6:RETURN
118 HCOLOR2:HDRAW"BM"+STR$(H)+",
8ØH1ØRF1ØRH1ØUHLGDFRULUR":RETURN
119 HCOLOR2:HDRAW"BM"+STR$(H)+",
8ØE1ØRG1ØRE1ØHUERFDGLURUL":RETUR
N
12Ø HCOLOR5:HDRAW"BM"+STR$(X)+",
121D8RU8":HCIRCLE(H,13Ø),7:HPAIN
T(H,13Ø),5,5:RETURN
121 HCOLOR3:HDRAW"BM"+STR$(H)+",
11ØNFLF2D15LU15H2LF2D16R6DL6DR6"
:RETURN
122 HCOLOR3:HDRAW"BM"+STR$(H)+",
114ND13LD13LU13D14R6DL6DR6":RETU
RN
123 HCOLOR3:HDRAW"BM"+STR$(H)+",
112ND13LD13LU13D14R6DL6DR6":RETU
RN
124 HCOLOR3:HDRAW"BM"+STR$(H)+",
1Ø3"+LR$:RETURN
125 HCOLOR3:HDRAW"BM"+STR$(H)+",
1Ø5"+LR$:RETURN
126 HCOLOR3:HDRAW"BM"+STR$(H)+",
1Ø5"+LR$:RETURN
127 HPRINT(3,21),"ALREADY HAVE I
T":RETURN
128 HPRINT(3,21),"YOU HAVE ENOUG
H":RETURN
129 HPRINT(23,21),"ALREADY HAVE
IT":RETURN
13Ø HPRINT(23,21),"YOU HAVE ENOU
GH":RETURN
131 POKE65496,Ø:WIDTH32:CLS:END
```

RAINBOWfest is the only computer show dedicated exclusively to your Tandy Color Computer.

Nowhere else will you see as many CoCo-related products or be able to attend free seminars conducted by the top Color Computer experts. It's like receiving the latest issue of THE RAINBOW in your mailbox!

RAINBOWfest is a **great opportunity** for commercial programmers **to show off new and innovative products for the first time. Princeton is the show** to get information on capabilities for the new CoCo 3, along with a terrific selection of the latest CoCo 3 software. In exhibit after exhibit, there will be demonstrations, opportunities to experiment with software and hardware, and special RAINBOWfest prices.

Set your own pace between visiting exhibits and attending the valuable, free seminars on all aspects of your CoCo — from improving BASIC skills to working with the sophisticated OS-9 operating system.

Many people who write for THE RAINBOW — as well as those who are written about — are there to meet you and answer questions. You'll also meet lots of other people who share your interest in the Color Computer. It's a person-to-person event and a tremendous learning experience in a fun and relaxed atmosphere.

A special feature of RAINBOWfest is the **Educational Sandbox**, which features **child-oriented workshops** to give hands-on experience to an age group often neglected. There are sessions for the kindergarten through third-graders, and for fourth- through seventh-graders. And, as an additional treat for CoCo Kids of all ages, we've invited frisky feline CoCo Cat to join us for the show. RAINBOWfest has something for everyone in the family!

If you missed the fun at our last RAINBOWfest in Chicago, why don't you make plans now to join us in Princeton? For members of the family who don't share your affinity for CoCo, there are many other attractions in the Princeton area.

The Hyatt Regency Princeton offers special rates for RAINBOWfest. **The show opens Friday evening** with a session from 7 p.m. to 10 p.m. It's a daytime show Saturday — the CoCo Community Breakfast (separate tickets required) is at 8 a.m., then the exhibit hall opens promptly at 10 a.m. and runs until 6 p.m. On Sunday, the exhibit hall opens at 11 a.m. and closes at 3 p.m.

Tickets for RAINBOWfest may be obtained directly from THE RAINBOW. We'll also send you a reservation form so you can get a special room rate.

The POSH way to go. You can have your travel arrangements and hotel reservations handled through RAINBOW affiliate, POSH Travel Assistance, Inc., of Louisville. For the same POSH treatment many of our exhibitors enjoy, call POSH at (502) 893-3311. All POSH services are available at no charge to RAINBOWfest attendees.

BE THERE!

SPECIAL EVENT!

COCO GALLERY LIVE
SHOWCASE YOUR BEST AT RAINBOWFEST

We are taking the popular "CoCo Gallery" on the road to RAINBOWfest Princeton — and we'd like you to submit your own graphics creations to be exhibited at the show!

RULES

- You can enter color or black-and-white photographs or printouts of your original artwork produced on the CoCo 1, 2 or 3. Entries must be framed, mounted or matted, and may not be smaller than 5-by-7 inches or larger than 11-by-14 inches.
- Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere. A digitized copy of a picture that appears in a book or magazine is ***not*** an original work.
- Along with your entry, send a cover letter with your name, address and phone number, detailing how you created your picture (what programs you used, etc.). Please include a few facts about yourself, too!
- Your name, address and phone number, along with the title of your work, must be clearly marked on the back of each entry, and a disk copy of each piece must also be included.
- Entries must be mailed to THE RAINBOW before October 10, 1988, or brought to the RAINBOWfest registration booth by 10 a.m., Saturday, October 22.
- All entries to CoCo Gallery Live become the property of Falsoft, Inc.

There will be two categories: one for graphics produced on the CoCo 1 and 2, and one for CoCo 3 graphics. Several awards will be made in each category. Winners will be determined by votes from RAINBOWfest attendees. In case of any ties, winners will be determined by our chief judge, CoCo Cat.

Prizes and ribbons will be presented Sunday, October 23, 1988, and winning entries will be published in the January '89 issue of THE RAINBOW. Send your entry to "CoCo Gallery Live," THE RAINBOW, 9509 U.S. Highway 42, Prospect, KY 40059.

YES, I'm coming to **Princeton!** I want to save by buying tickets now at the special advance sale price. Breakfast tickets require advance reservations.

Please send me:

____ Three-day ticket(s) at $9 each total ____

____ One-day ticket(s) at $7 each total ____
Circle one: Friday Saturday Sunday

____ Saturday CoCo Breakfast at $12 each total ____

____ RAINBOWfest T-shirt(s) at $6 each total ____
Specify size:
____ S ____ M ____ L ____ XL
(T-shirts must be picked up at the door)

Handling Charge $1 ____

TOTAL ENCLOSED ____
(U.S. Currency Only, Please)

☐ Also send me a hotel reservation card for the Hyatt Regency Princeton ($88, single or double room).

Name ____
(please print)

Address ____

City ____ State ____

Telephone ____ ZIP ____

Company ____

☐ Payment Enclosed, or Charge to:

☐ VISA ☐ MasterCard ☐ American Express

Account Number ____

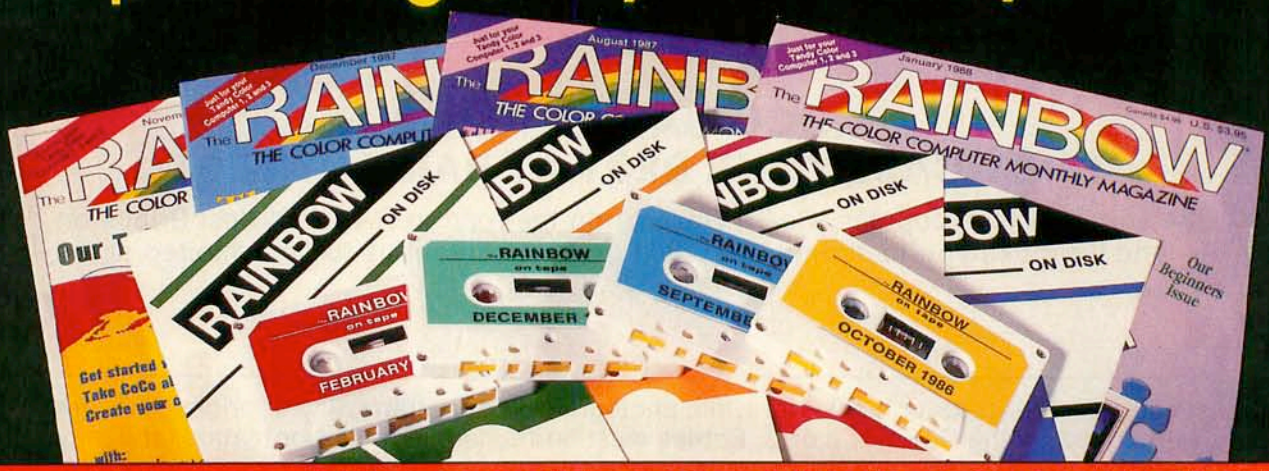
Exp. Date ____

Signature ____

Advance ticket deadline: October 7, 1988. Orders received less than two weeks prior to show opening will be held for you at the door. Tickets will also be available at the door at a slightly higher price. Tickets will be mailed six weeks prior to show. Children 4 and under, free; over 4, full price.

Make checks payable to: The RAINBOW. Mail to: RAINBOWfest, The Falsoft Building, 9509 U.S. Highway 42, P.O. Box 385, Prospect, KY 40059. To make reservations by phone, in Kentucky call (502) 228-4492, or outside Kentucky call (800) 847-0309.

Still pounding away at that keyboard?



Save Time and Money with a Combination Subscription!

SAVE up to 19%

when you buy a joint subscription to the magazine and either RAINBOW ON TAPE or RAINBOW ON DISK! A one-year subscription to THE RAINBOW and RAINBOW ON TAPE is only $91 in the U.S., $108 in Canada, $153 foreign surface rate and $188 foreign airmail. A one-year subscription to THE RAINBOW and RAINBOW ON DISK is only $115 in the U.S., $138 in Canada, $183 foreign surface rate and $218 foreign airmail.*

Every month, these convenient services bring you as many as 24 ready-to-run programs. Using the current issue of THE RAINBOW as documentation, all you have to do is load and run them. A one-year combination subscription to THE RAINBOW and RAINBOW ON TAPE or RAINBOW ON DISK give you more than 230 new programs! The typing time you save can be spent enjoying your CoCo!

RAINBOW ON TAPE For No-Fuss Fun

Back issues of RAINBOW ON TAPE are available beginning with the April 1982 issue. A single copy of RAINBOW ON TAPE is $10 within the United States; U.S. $12 in all other countries. The annual subscription rate for RAINBOW ON TAPE is $80 within the U.S.; U.S. $90 in Canada; and U.S. $105 for all other countries.*

RAINBOW ON DISK Offers OS-9 Programs

In addition to all the programs offered on tape, part of one side of RAINBOW ON DISK is formatted for the OS-9 operating system. That means you can now get all the OS-9 programs from the magazine — programs that cannot be put on tape. Back issues of RAINBOW ON DISK are available beginning with October 1986. Subscriptions to RAINBOW ON DISK are $99 a year in the U.S. Canadian rate is U.S. $115. All other countries, U.S. $130. Single copy rate is $12 in the U.S.; U.S. $14 in Canada; and U.S. $16 in all other countries.*

To order by phone (*credit card orders only*), call (800) 847-0309, 8 a.m. to 5 p.m. EST. All other inquiries call (502) 228-4492.

Look for our envelope located between pages 66 and 67 for ordering individual subscriptions to THE RAINBOW, RAINBOW ON TAPE and RAINBOW ON DISK.

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☐ **THE RAINBOW and RAINBOW ON DISK**
☐ **NEW** ☐ **RENEWAL** (attach labels)

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Account Number _____
Signature _____ **Exp.** _____

*U.S. currency only, please. In order to hold down costs, we do not bill. Kentucky residents add 5% sales tax. Please allow 6 to 8 weeks for delivery of first copies. Joint subscriptions to THE RAINBOW and RAINBOW ON TAPE or RAINBOW ON DISK begin with the current issue.

Please note: While group purchases of RAINBOW ON TAPE and RAINBOW ON DISK are permitted (and multiple subscriptions are even discounted, if purchased in one order from a club), no license to make copies is conveyed or implied. Yes, your group may even purchase a subscription to our disk/tape services, but such purchase in no way authorizes that *any* copies be made of that original disk/tape. Specifically, this means that the original disk/tape itself may indeed be kept in a club library for use by members. However, a group purchase *does not* entitle club members, individually or as a group, to copy that disk/tape.

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Printing in italics on the Tandy DMP-105 printer

Emphasize With the DMP-105

By David Francis

This program will allow you to add the capability of printing italics on the Tandy DMP-105. It is self-prompting and very easy to use.

When you run *Italics-105* the title banner is displayed and a check is made to ensure the printer is ready. The data for the characters is read into an array, and you are asked for the name of the file you wish to print in italics. This file is opened and printing begins.

> The Color Computer 3 can be used in small business and home applications such as graphics, programming, budgets, word processing, database management, spreadsheet analysis and many others. The Color Computer 3 comes with 128K memory (expandable to 512K), and gives you the advantage of greater programming and data processing power, as well as higher resolution graphics.

Although the operation of this program is very straightforward, it can be used in two basic ways. First, if you wish to print an entire document in italics, save the document to disk in ASCII format using a word processor. Run *Italics-105*, and enter the name under which you saved the document. On the other hand, if you simply wish to print part of a document in italics, you must first save that part of the document in ASCII format. Then print the main document up to the section you want to be in italics. Run *Italics-105* and print the italicized portion. Now return to your word processor and finish printing the remainder of the main document.

If your computer will not operate in the high-speed mode, be sure to delete lines 1030 and 4040. The baud rate is set to 2400 in Line 7050, so if for some reason you must print at 600 baud, be sure to delete this line as well. Keep in mind that *everything* you save will be printed, including control codes.

David Francis, who recently received his bachelor's degree in linguistics, has owned a Color Computer for five years. He enjoys music, reading and programming.

Use your imagination to mix the new characters with the others available on the DMP-105. You can easily create eye-catching notices and fliers.

(Questions or comments regarding this program may be directed to the author at Box 49793, Austin, TX 78765. Please enclose an SASE when requesting a reply.) □

```
1120 .....10  10400 ....100
3090 .....66  10560 ....115
6070 .....108 10720 ....220
10090 ....110 10830 ....212
10250 ....179 END .....50
```

The listing: ITALICS

```
10 ' &&&&&&&&&&&&&&&&&&&&&&&&&&&&
20 ' &       ITALICS-105          &
30 ' &    BY DAVID FRANCIS        &
40 ' &&&&&&&&&&&&&&&&&&&&&&&&&&&&
50 CLEAR2000
60 GOSUB5000  ' PRINT TITLE
70 GOSUB6000  ' PRINTER ONLINE?
80 GOSUB7000  ' SETUP
90 GOSUB4000  ' READ CHAR. DATA
100 GOSUB3000 ' GET FILENAME
110 GOSUB2000 ' LOAD STRING
120 IF FLAG=1 THEN150
130 GOSUB1000 ' PRINT CHARS.
140 GOTO110
150 PRINT@161,STRING$(254," ")
155 PRINT@161,"END OF "F$
160 PRINT#-2,CHR$(30);:PRINT:END
```

```
1000 ' ========================
1010 ' PRINT CHARACTERS
1020 ' ========================
1030 POKE65495,0
1040 FOR I=1 TO LEN(T$)
1050 Z=ASC(MID$(T$,I,1))
1060 IFZ<32 THEN IF Z=13 THENPRI
NT#-2:PRINT#-2:GOTO1100
1070 Z=Z-31
1080 POKE65494,0
1090 PRINT#-2,A$(Z);
1100 NEXT
1110 PRINT#-2:PRINT#-2
1120 POKE65494,0
1130 RETURN
2000 ' ========================
2010 ' LOAD STRING
2020 ' ========================
2030 IF EOF(1) THENCLOSE:FLAG=1:
GOTO2080
2040 LINEINPUT#1,T$
2050 IFT$="" THEN2030
2060 PRINT@161,STRING$(254,32)
2070 PRINT@161,T$
2080 RETURN
3000 ' ========================
3010 ' GET FILENAME
3020 ' ========================
3030 PRINT@161,"ENTER FILENAME T
O BE PRINTED    (MUST BE IN ASCI
I FORMAT):      ";:LINEINPUTF$
3040 IFF$="" THEN3030
3050 EXT=INSTR(F$,"/")
3060 IF EXT<>0 THEN IF LEN(F$)>1
2 THEN PRINT@289,"FILENAME TOO L
ONG":GOTO3030
3070 IF EXT=0 THEN IF LEN(F$)>8
THEN PRINT@289,"FILENAME TOO LON
G.":GOTO3030
3075 PRINT@289,STRING$(32," ")
3080 OPEN"I",1,F$
3090 RETURN
4000 ' ========================
4010 ' READ CHAR. DATA
4020 ' ========================
4030 PRINT@161," WORKING, PLEASE
 WAIT...":PRINTSTRING$(32," ")
4040 POKE65495,0
4050 FORX=1 TO 91
4060 READA:IF A=999 THEN4090
4070 A$(X)=A$(X)+CHR$(A)
4080 GOTO4060
4090 NEXT
4100 POKE65494,0
4110 RETURN
5000 ' ========================
5010 ' PRINT TITLE
5020 ' ========================
5030 CLS:PRINTSTRING$(32,175);
5040 PRINTTAB(10)"ITALICS-105"
5050 PRINTTAB(7)"BY DAVID FRANCI
S"
5060 PRINTSTRING$(32,175)
5070 RETURN
6000 ' ========================
6010 ' PRINTER ONLINE?
6020 ' ========================
6030 IFPEEK(65314)<>5 THEN6080
6040 PRINT@161,"PRINTER IS NOT R
EADY.  PRESS    ANY KEY WHEN PRI
NTER IS READY."
6050 I$=INKEY$:IFI$=""THEN6050
6060 GOTO6030
6070 PRINT@161,STRING$(254," ");
6080 RETURN
7000 ' ========================
7010 ' SETUP
7020 ' ========================
7030 DIMA$(100)
7040 FLAG=0
7050 POKE150,18
7060 PRINT#-2,CHR$(27);CHR$(20);
CHR$(18);CHR$(27);CHR$(16);CHR$(
0);CHR$(0);
7070 RETURN
10000 ' ========================
10010 ' CHARACTER DATA
10020 ' ========================
10030 DATA 128,128,128,128,128,1
28,128,999
10040 DATA 128,128,192,128,144,1
36,132,130,129,999
10050 DATA 128,128,132,130,129,1
32,130,129,999
10060 DATA 128,128,192,176,144,2
20,180,150,157,132,134,129,999
10070 DATA 128,128,160,224,164,1
86,170,174,154,131,130,128,128,9
99
10080 DATA 128,128,194,163,145,1
37,197,227,161,128,128,999
10090 DATA 128,128,224,208,206,2
17,163,208,128,128,999
10100 DATA 128,128,132,130,129,9
99
10110 DATA 128,128,176,200,132,1
30,129,129,999
10120 DATA 128,128,192,192,160,1
44,137,135,128,999
10130 DATA 128,128,132,148,143,1
58,133,132,999
10140 DATA 128,128,168,152,136,1
40,138,999
10150 DATA 128,128,192,176,144,1
28,128,128,999
10160 DATA 128,128,136,136,136,1
36,136,999
10170 DATA 128,128,192,224,160,1
28,128,999
10180 DATA 128,128,192,190,129,9
99
10190 DATA 224,208,216,212,202,1
```

```
69,149,141,133,131,999
1Ø2ØØ DATA 192,192,224,144,138,1
33,131,129,999
1Ø21Ø DATA 192,224,2Ø8,2ØØ,2Ø2,2
Ø1,137,133,131,999
1Ø22Ø DATA 224,192,194,2Ø1,2Ø1,1
69,153,133,131,999
1Ø23Ø DATA 152,212,178,146,154,1
33,131,129,128,999
1Ø24Ø DATA 224,192,196,198,197,1
65,149,141,129,128,999
1Ø25Ø DATA 224,2Ø8,2ØØ,2Ø4,2Ø2,1
69,153,129,128,999
1Ø26Ø DATA 192,161,145,137,133,1
31,128,999
1Ø27Ø DATA 224,2Ø8,2Ø4,2Ø2,2Ø1,1
69,153,133,131,128,999
1Ø28Ø DATA 192,192,2Ø4,2Ø2,169,1
53,137,133,131,128,999
1Ø29Ø DATA 128,128,16Ø,176,148,1
34,13Ø,128,999
1Ø3ØØ DATA 128,128,192,192,176,1
48,134,13Ø,128,999
1Ø31Ø DATA 128,128,152,164,194,1
29,128,999
1Ø32Ø DATA 128,128,144,148,148,1
48,148,132,999
1Ø33Ø DATA 128,128,192,161,146,1
4Ø,128,999
1Ø34Ø DATA 128,128,192,13Ø,145,1
37,133,131,128,999
1Ø35Ø DATA 128,128,224,2Ø8,2Ø2,2
33,217,169,145,142,999
1Ø37Ø DATA 192,16Ø,144,152,148,1
46,255,128,128,999
1Ø38Ø DATA 192,192,224,2Ø8,2ØØ,2
Ø5,2Ø3,169,153,133,13Ø,999
1Ø39Ø DATA 224,2Ø8,2ØØ,196,194,1
93,161,129,131,999
1Ø4ØØ DATA 192,192,224,2Ø8,2ØØ,1
96,195,161,145,137,133,13Ø,999
1Ø41Ø DATA 192,224,2Ø8,2ØØ,2Ø4,2
Ø2,2Ø1,129,129,129,129,999
1Ø42Ø DATA 192,16Ø,144,136,14Ø,1
38,137,129,129,129,129,999
1Ø43Ø DATA 224,2Ø8,2ØØ,196,194,2
Ø9,177,145,131,999
1Ø44Ø DATA 192,16Ø,144,136,14Ø,2
Ø2,169,152,136,132,13Ø,129,999
1Ø45Ø DATA 192,192,224,144,136,1
32,131,129,129,999
1Ø46Ø DATA 224,2Ø8,192,192,192,1
6Ø,144,136,132,13Ø,129,999
1Ø47Ø DATA 192,16Ø,144,136,14Ø,1
54,169,2ØØ,132,13Ø,129,999
1Ø48Ø DATA 192,224,2Ø8,2ØØ,196,1
94,129,128,999
1Ø49Ø DATA 192,16Ø,144,136,132,1
```

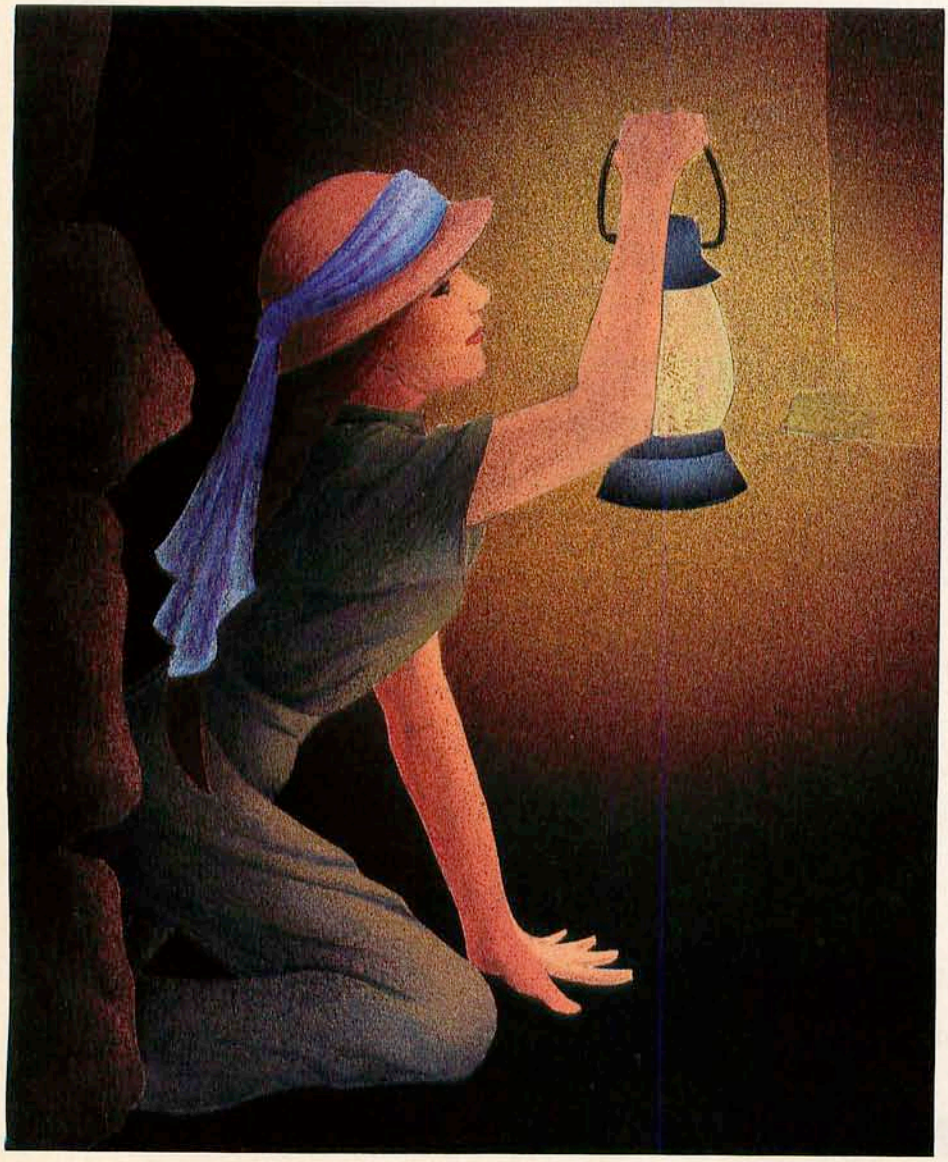
```
3Ø,193,162,148,138,133,131,129,9
99
1Ø5ØØ DATA 192,16Ø,144,136,132,1
3Ø,255,144,136,132,13Ø,129,999
1Ø51Ø DATA 224,2Ø8,2ØØ,196,194,1
61,145,137,133,13Ø,999
1Ø52Ø DATA 192,16Ø,144,136,14Ø,1
38,137,137,137,137,133,13Ø,999
1Ø53Ø DATA 224,2Ø8,2ØØ,196,21Ø,1
61,2Ø9,137,133,131,999
1Ø54Ø DATA 192,16Ø,144,136,14Ø,1
38,153,169,2Ø1,137,133,13Ø,999
1Ø55Ø DATA 192,192,196,2Ø2,2Ø1,2
Ø1,169,145,129,999
1Ø56Ø DATA 192,16Ø,144,137,133,1
31,129,129,129,999
1Ø57Ø DATA 224,2Ø8,2ØØ,196,194,1
61,144,136,132,13Ø,129,999
1Ø58Ø DATA 128,128,255,144,136,1
32,13Ø,129,999
1Ø59Ø DATA 224,2Ø8,2ØØ,164,21Ø,2
Ø1,16Ø,144,136,132,13Ø,129,999
1Ø6ØØ DATA 192,16Ø,144,255,132,1
3Ø,129,999
1Ø61Ø DATA 192,16Ø,159,136,132,1
3Ø,129,999
1Ø62Ø DATA 192,224,2Ø9,2Ø1,197,1
31,129,999
1Ø63Ø DATA 192,224,2Ø8,136,132,1
3Ø,129,129,999
1Ø64Ø DATA 128,129,19Ø,192,128,9
99
1Ø65Ø DATA 192,192,192,16Ø,144,1
36,133,131,129,999
1Ø66Ø DATA 136,132,13Ø,143,999
1Ø68Ø DATA 128,128,135,136,999
1Ø69Ø DATA 128,999
1Ø7ØØ DATA 224,2Ø8,212,212,244,2
12,136,999
1Ø71Ø DATA 192,224,2Ø8,2ØØ,196,1
98,165,148,136,999
1Ø72Ø DATA 224,2Ø8,2ØØ,196,196,1
32,132,999
1Ø73Ø DATA 224,2Ø8,2ØØ,196,196,1
64,148,14Ø,132,13Ø,129,999
1Ø74Ø DATA 224,2Ø8,216,212,212,1
48,148,136,999
1Ø75Ø DATA 192,16Ø,152,136,14Ø,1
38,129,129,13Ø,999
1Ø76Ø DATA 192,192,216,212,18Ø,1
48,14Ø,132,999
1Ø77Ø DATA 192,16Ø,144,136,132,1
98,165,148,136,999
1Ø78Ø DATA 192,16Ø,144,136,132,1
28,129,999
1Ø79Ø DATA 224,192,192,16Ø,144,1
36,132,128,129,999
1Ø8ØØ DATA 192,16Ø,144,136,156,1
7Ø,2Ø1,136,999
1Ø81Ø DATA 192,192,224,144,136,1
32,131,129,999
1Ø82Ø DATA 192,16Ø,144,14Ø,164,1
48,2ØØ,164,152,999
1Ø83Ø DATA 192,16Ø,144,14Ø,196,1
64,148,136,999
1Ø84Ø DATA 224,2Ø8,2ØØ,196,196,1
64,148,14Ø,999
1Ø85Ø DATA 192,16Ø,144,152,148,1
48,148,136,128,999
1Ø86Ø DATA 128,152,212,18Ø,148,1
4Ø,132,999
1Ø87Ø DATA 192,16Ø,144,136,132,1
32,132,136,999
1Ø88Ø DATA 192,192,216,212,212,1
64,132,999
1Ø89Ø DATA 224,2Ø8,2Ø4,132,134,1
32,999
1Ø9ØØ DATA 224,2Ø8,2ØØ,196,224,2
Ø8,136,132,999
1Ø91Ø DATA 128,252,16Ø,144,136,1
32,999
1Ø92Ø DATA 224,2Ø8,2ØØ,164,2Ø8,1
92,16Ø,144,136,132,999
1Ø93Ø DATA 192,16Ø,144,252,136,1
32,999
1Ø94Ø DATA 192,216,212,176,144,1
36,132,999
1Ø95Ø DATA 192,228,212,2Ø4,132,9
99
```

Dr. Nibble

By Kelly Taylor

Just when you thought it was safe to go back into the tombs . . .

Escape From Tut's Tomb, Parts 2 and 3



By Chris McKernan

Talk about cliffhangers, gentle reader. Last month we left you busily keying in the first part of *Tut's Tomb*. No doubt you took a tumble into the passages and found yourself menaced by scorpion-tailed bats, disembodied dragon heads and other uglies. You might have discovered that it's hard to stay alive to the end of a five-level maze when you have only three lives. Those are the breaks, Adventurer.

But if you're one of the quick-on-your-feet elite, you might have made it past the curses, the vile creatures whose job it is to prevent you from completing the fifth and final maze of Part 1 and receiving your hint. (*What* hint? We're not telling.)

In fact, if you made it through Part 1 of *Tut's Tomb*, you can classify yourself as an arcade addict. And from there it's a safe assumption that right now you are experiencing withdrawal symptoms induced by the *Tut's Tomb* cliffhanger. (You'll recognize this condition by observing the behavior of your fingers, which will restlessly seek to manipulate a joystick that isn't there.)

Here at THE RAINBOW, we take everyone's welfare to heart — even you arcade junkies and video Adventurers. And so, without further ado, we bring you parts 2 and 3 of *Tut's Tomb*, which add up to 10 more mazes of thrills-and-chills excitement!

Part 2

Flex your fingers and follow these steps to key in Part 2 of *Tut's Tomb*:

1) Type in and save the listings `2PART1` and `2PART2`
2) Reset the computer with a cold start (enter `POKE 113,0` and press the reset button) and load `TUT1` from last month by entering (`C`) `LOADM "TUT1",16384`

Chris McKernan is an electronics technician for Paramax Electronics. His hobbies include computers, photography and music.

3) RUN "2PART1"
4) RUN "2PART2"
5) (C)SAVEM "TUT2",20479, 26405,26405
6) (C)LOADM "TUT2",49152
7) (C)SAVEM "TUT2",4095, 10021,10011

When run, the two BASIC listings build a machine language file, TUT2. Steps 6 and 7 change the loading addresses.

Part 3

To generate Part 3 of *Tut's Tomb*, TUT3, do the following:

1) Type in and save the listings 3PART1 and 3PART2
2) Reset the computer with a cold start (enter POKE 113,0 and press the reset button) and load TUT1 from last month by entering (C)LOADM "TUT1",16384)
3) RUN "3PART1"
4) RUN "3PART2"
5) (C)SAVEM "TUT3",20479, 26405,26405
6) (C)LOADM "TUT3",49152
7) (C)SAVEM "TUT3",4095, 10021,10011

You have now created the third and final machine language file, TUT3.

Wrapping It Up

After all this work, your *Tut's Tomb* program should consist of the following files:

```
ONE.BAS
TWO.BAS
THREE.BAS
FOUR.BAS
TUT1.BIN
2PART1.BAS
2PART2.BAS
TUT2.BIN
3PART1.BAS
3PART2.BAS
TUT3.BIN
```

All you have to do to execute the game is enter (C)LOADM "TUT1" and EXEC.

Mummy's the Word

For the benefit of those who were not with us last month, *Tut's Tomb* is an arcade game in which as an Adventurer you have discovered the priceless tomb of King Tut — but at perhaps the cost of your life (of which you have three, by the way).

Five obstacles stand in your way to riches, fame and glory, and rather ghastly obstacles at that: scorpion-tailed bats, blue serpents, giant spiders, disembodied dragon heads and curses. For your defense against these creatures, you carry a musket, which you can fire only to the left and right; you need a joystick plugged into the right joystick port. Creatures are killed by being shot in the upper part of their bodies. But you can't get rid of them for long, however: Every time a creature is killed near its lair, a new one materializes to take its place.

In each maze level, the goal is to grab all the goodies you can (not forgetting the key) and sneak past the monsters into the next level.

Programming buffs might want to examine Table 1 for a listing of the routines used and their locations.

Psst! If you find you're losing all your lives before you can complete even the first or second maze, you might want to check out the program *Immortality Finder* in Novices Niche, Page 76.

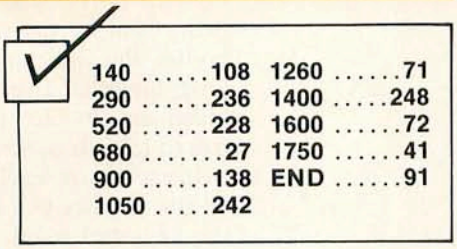
(Questions or comments regarding this program may be directed to the author at 2369 Madison #9, Montreal, Quebec, Canada H4B 2T5. Please enclose an SASE when requesting a reply.) □

Table 1: Routines Listing

LOCATION	NAME OF ROUTINE
5939 (BASE 10)	Sound Routine
6000	PMODE
6023	PCLS
6036	Character print X=LOC A=CHAR
6062	SCORE (Prints Score)
6108	"HIGH:"
6149	Highscore print
6195	LVL:0 (not used)
6237	SHIPS:0 (not used)
6256	Print Maze
6403	Maze Data
6511	Check Up
6541	Check Down — for explorer
6562	Check Left
6581	Check Right
6600	Print Man
6628	Erase Man
6647	Move Up
6670	Move Down — for explorer
6693	Move Left
6715	Move Right
6738	Laser Right
6789	Laser Left
6846	Move or Fire (Main Routine)
6926	Print Key & Treasure
6978	New Game Resets Variables
7002	Clear Creatures Resets Positions
7024	Print Smoke X=LOC
7049	Blank Print X=LOC
7066	Points (creature)
7104	Check Hit
7247	Print Creature

LOCATION	NAME OF ROUTINE
7278	Initialize Creatures
7397	Check Left
7412	Check Right — for Creatures
7427	Check Up
7442	Check Down
7459	Dir 5 (exit Lair)
7533	Pick Direction
7642	Move Left
7667	Move Right
7692	Move Down
7718	Move Up
7744	Move 2
7804	Creature Main Movement
7894	— STOP —
9307	Move Change
9451	Change 2
9548	Take Prize
9601	Print Key
9636	Take Key
9678	Next Maze??
9742	Check for kill
9810	Implement Check
9853	DIR 5 SOUND
9909	Clear screen, print key, treasure & CAM
10006	— STOP —
10011	Relocate Stacks & Start Game
5130	Print "GAME OVER"
5200	Dead Sound
5300	Laser Sound
5400	Delay Creature dead (smoke)
5550	Sound Key
5600	Sound Treasure

Editor's Note: For your convenience, last month's machine language file, TUT1, *is included on this month's* RAINBOW ON TAPE *and* DISK, *along with this month's four* BASIC *programs and the two ML files for parts 2 and 3 of* Tut's Tomb*:* TUT2.BIN *and* TUT2.BIN. RAINBOW ON TAPE *and* DISK *users will only need to load Part 1,* TUT1, *and type* EXEC. *The files have already been moved to their proper memory locations.*



140	108	1260	71
290	236	1400	248
520	228	1600	72
680	27	1750	41
900	138	END	91
1050	242		

Listing 1: 2PART1

```
5 CLEAR 1ØØ,&H4FFE
1Ø REM ########################
       ## RUN after LOADING  ##
       ## TUT1 SEE TEXT      ##
       ########################
15 FOR X=2Ø479 TO 21959:READ DT:
POKE X,DT:NEXT X
2Ø DATA 189,18,119,189,23,112,18
9,23
3Ø DATA 135,189,38,229,189,23,17
4,189
4Ø DATA 23,22Ø,189,24,5,189,24,9
3
5Ø DATA 127,3Ø,25Ø,134,1,183,31,
54
6Ø DATA 183,31,55,134,24Ø,183,31
,24
7Ø DATA 189,25,3,189,24,112,189,
25
8Ø DATA 2ØØ,189,27,14,189,27,9Ø,
189
9Ø DATA 18,92,182,255,Ø,129,254,
39
1ØØ DATA 4,129,126,38,245,189,37
,76
11Ø DATA 189,37,164,189,38,82,18
9,38
12Ø DATA 125,79,177,3Ø,237,38,19
,189
13Ø DATA 2Ø,1Ø,182,255,Ø,129,254
,16
14Ø DATA 39,255,157,129,126,38,2
43,126
15Ø DATA 15,255,189,26,19Ø,189,3
7,2Ø6
16Ø DATA 189,28,11Ø,189,29,35,18
9,16
17Ø DATA 162,189,16,152,189,3Ø,1
24,189
18Ø DATA 25,2ØØ,189,23,174,189,3
6,235
19Ø DATA 16,142,Ø,Ø,49,33,16,14Ø
2ØØ DATA 9,196,39,2,32,246,126,1
6
21Ø DATA 68,79,189,25,228,57,128
,184
22Ø DATA 255,15,57,182,39,116,12
9,18Ø
23Ø DATA 36,7,139,6Ø,183,39,116,
32
24Ø DATA 3,127,39,116,189,29,1Ø9
,57
25Ø DATA 57,255,255,255,255,255,
255,255
26Ø DATA 255,Ø,Ø,Ø,Ø,Ø,Ø,Ø
27Ø DATA Ø,Ø,Ø,Ø,Ø,134,128,184
28Ø DATA 255,15,182,255,15,183,4
,Ø
29Ø DATA 32,243,Ø,Ø,Ø,Ø,Ø,Ø
3ØØ DATA Ø,Ø,Ø,Ø,4,Ø,Ø,Ø
31Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
32Ø DATA 4,Ø,Ø,Ø,Ø,Ø,Ø,Ø
33Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
34Ø DATA 83,251,255,255,255,255,
255,255
35Ø DATA 255,255,255,255,255,255
,255,255
36Ø DATA 255,255,255,255,255,255
,255,255
37Ø DATA 255,255,255,255,255,255
,255,255
38Ø DATA 255,255,255,255,255,255
,255,255
39Ø DATA 255,255,255,255,255,255
,255,255
4ØØ DATA 255,255,255,255,255,255
,255,255
41Ø DATA 255,255,255,255,255,255
,255,255
42Ø DATA 255,Ø,Ø,Ø,Ø,Ø,Ø,Ø
43Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
44Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
45Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
46Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
47Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
48Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
49Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
5ØØ DATA 35,255,255,255,255,255,
255,255
51Ø DATA 255,255,255,255,255,255
,255,255
52Ø DATA 255,255,255,255,255,189
,21,224
53Ø DATA 189,21,224,189,21,224,1
27,255
54Ø DATA 2Ø1,127,255,34,127,255,
2Ø2,127
55Ø DATA 255,2Ø6,127,255,192,127
,255,194
56Ø DATA 127,255,196,142,17,248,
16,142
57Ø DATA 4,Ø,95,166,128,167,16Ø,
```

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```
92
58Ø DATA 193,78,39,2,32,245,182,
3Ø
59Ø DATA 22Ø,183,15,161,182,3Ø,2
21,183
6ØØ DATA 15,162,182,3Ø,222,183,1
5,163
61Ø DATA 182,3Ø,223,183,15,164,1
82,3Ø
62Ø DATA 224,183,15,165,134,1ØØ,
183,15
63Ø DATA 16Ø,57,4,4,4,4,4,4
64Ø DATA 4,Ø,Ø,Ø,Ø,Ø,Ø,Ø
65Ø DATA Ø,3,12,21,5,32,4,5
66Ø DATA 5,16,5,18,32,1,14,4
67Ø DATA 32,4,5,5,16,5,18,32
68Ø DATA 32,32,32,32,32,32,32,32
5,255,255
1Ø6Ø DATA 255,Ø,Ø,Ø,Ø,Ø,Ø,Ø
1Ø7Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
1Ø8Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
1Ø9Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
11ØØ DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
111Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
112Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
113Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
114Ø DATA 193,255,255,255,255,25
5,74,32
115Ø DATA 32,255,255,255,255,255
,255,255
116Ø DATA 255,255,255,255,255,25
5,255,255
117Ø DATA 255,255,255,255,255,25
5,255,255
118Ø DATA 255,255,255,255,255,25
5,255,255
119Ø DATA 255,255,255,255,255,25
5,255,255
12ØØ DATA 255,255,255,255,255,25
5,255,255
121Ø DATA 255,255,255,255,255,25
5,255,255
122Ø DATA 255,Ø,Ø,Ø,Ø,Ø,Ø,Ø
123Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,28,185
124Ø DATA 187,185,197,162,3Ø,13,
185,236
125Ø DATA 187,185,197,189,51,177
,1Ø6,Ø
126Ø DATA 188,225,183,77,174,84,
173,45
127Ø DATA 173,196,Ø,Ø,Ø,Ø,Ø,85
128Ø DATA 85,85,85,85,85,85,85,8
5
129Ø DATA 85,85,85,85,85,85,85,8
5
13ØØ DATA 85,85,85,85,85,85,85,8
5
131Ø DATA 85,85,85,142,42,77,134
,13
132Ø DATA 189,23,148,142,42,78,1
34,19
133Ø DATA 189,23,148,142,42,79,1
34,2Ø
134Ø DATA 189,23,148,142,42,8Ø,1
34,21
135Ø DATA 189,23,148,142,42,82,1
34,22
136Ø DATA 189,23,148,142,42,83,1
34,23
137Ø DATA 189,23,148,142,42,84,1
34,24
138Ø DATA 189,23,148,142,42,85,1
34,25
139Ø DATA 189,23,148,57,7Ø,68,32
,13
14ØØ DATA Ø,198,3Ø,247,2Ø,179,13
4,255
141Ø DATA 16,142,Ø,15,189,23,51,
246
142Ø DATA 2Ø,179,9Ø,193,1,39,5,2
47
143Ø DATA 2Ø,179,32,234,57,Ø,Ø,Ø
144Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
145Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
146Ø DATA Ø,118,255,255,255,255,
255,255
147Ø DATA 255,255,255,255,255,25
5,255,255
148Ø DATA 255,255,255,255,255,25
5,255,255
149Ø DATA 255,255,255,255,255,25
5,255,255
15ØØ DATA 255,255,255,255,255,25
5,255,84
151Ø DATA 85,84,84,69,84,85,84,6
6
152Ø DATA 13,13,13,32,2,191,21,2
2
153Ø DATA 142,36,14,16,142,Ø,2,1
34
154Ø DATA 255,23Ø,132,189,23,51,
48,1
155Ø DATA 14Ø,36,33,46,2,32,236,
19Ø
156Ø DATA 21,22,57,Ø,Ø,Ø,Ø,Ø
157Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
158Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
159Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
16ØØ DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
161Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
162Ø DATA Ø,25,255,255,255,255,2
55,255
163Ø DATA 255,255,255,255,255,25
5,255,255
164Ø DATA 255,255,255,255,255,25
5,255,55
165Ø DATA 122,16,142,Ø,Ø,49,33,1
6
166Ø DATA 14Ø,15,16Ø,38,248,57,1
98,5Ø
167Ø DATA 16,142,Ø,4Ø,189,23,51,
134
```

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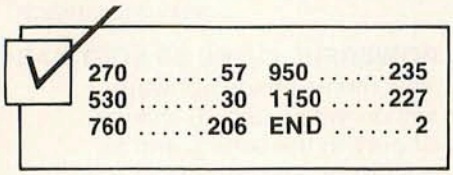
```
168Ø DATA 255,198,3Ø,16,142,Ø,2Ø
,189
169Ø DATA 23,51,57,12Ø,246,21,11
9,9Ø
17ØØ DATA 193,3Ø,37,5,247,21,119
,32
171Ø DATA 223,57,Ø,16,142,31,49,
189
172Ø DATA 37,37,57,Ø,Ø,Ø,Ø,Ø
173Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
174Ø DATA 5,185,161,161,222,7,25
5,82
175Ø DATA 161,197,11,Ø,Ø,171,238
,161
176Ø DATA 181,1,2,221,161,161,2,
4
177Ø DATA 3Ø,Ø,79,Ø,Ø,Ø,Ø,Ø
178Ø DATA 27,255,255,255,255,255
,255,255
179Ø DATA 255,255,255,255,255,83
,84,69
18ØØ DATA 83,84,7Ø,7Ø,7Ø,7Ø,7Ø,8
4
181Ø DATA 85,84,66,65,83,73,67,6
7
182Ø DATA 67,67,67,67,67,67,67,6
7
183Ø DATA 67,67,67,67,67,67,255,
134
184Ø DATA 255,198,5Ø,16,142,Ø,23
Ø,189
185Ø DATA 23,51,134,255,198,25,1
6,142
186Ø DATA Ø,115,189,23,51,134,25
5,198
187Ø DATA 5Ø,16,142,Ø,23Ø,189,23
,51
```



```
270 .....57  950 .....235
530 .....30  1150 ....227
760 .....206 END .....2
```

Listing 2: 2PART2

```
5 CLEAR 1ØØ,&H4FFE
1Ø REM ########################
       ## RUN AFTER RUNNING  ##
       ## 2PART1 SEE TEXT    ##
       ########################
15 FOR X=24584 TO 25634:READ DT:
POKE X,DT:NEXT X
2Ø DATA 4,4,4,4,4,4,4,4
3Ø DATA 4,4,Ø,Ø,Ø,Ø,Ø,4
4Ø DATA Ø,Ø,Ø,4,Ø,4,Ø,4
5Ø DATA 4,Ø,Ø,Ø,Ø,Ø,Ø,Ø
6Ø DATA 4,Ø,4,Ø,1,4,Ø,4
7Ø DATA 3,Ø,4,Ø,4,4,Ø,4
8Ø DATA 4,Ø,Ø,Ø,4,3,Ø,4
9Ø DATA 4,4,4,4,4,4,4,4
1ØØ DATA 4,4,4,4,4,4,4,4
11Ø DATA 4,3,Ø,Ø,Ø,Ø,Ø,4
12Ø DATA 4,4,Ø,4,Ø,4,Ø,4
13Ø DATA Ø,Ø,Ø,4,Ø,4,4,4
14Ø DATA 4,4,4,4,Ø,4,Ø,Ø
15Ø DATA 4,4,Ø,Ø,Ø,Ø,Ø,4
16Ø DATA 4,3,Ø,4,1,4,Ø,4
17Ø DATA 4,4,4,4,4,4,4,4
18Ø DATA 4,4,4,4,4,4,4,4
19Ø DATA 4,Ø,Ø,Ø,Ø,Ø,Ø,Ø
2ØØ DATA 4,Ø,4,Ø,4,Ø,Ø,4
21Ø DATA 4,Ø,3,Ø,4,Ø,Ø,4
22Ø DATA Ø,Ø,4,Ø,4,Ø,Ø,4
23Ø DATA 4,4,4,Ø,Ø,Ø,Ø,4
24Ø DATA 4,3,Ø,Ø,4,4,1,4
25Ø DATA 4,4,4,4,4,4,4,4
26Ø DATA 4,4,4,4,4,4,4,4
27Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,4
28Ø DATA 4,Ø,4,Ø,Ø,4,Ø,4
29Ø DATA 4,Ø,Ø,Ø,Ø,4,Ø,Ø
3ØØ DATA 4,Ø,4,Ø,Ø,4,Ø,4
31Ø DATA 3,Ø,4,Ø,Ø,4,Ø,4
32Ø DATA 4,Ø,4,Ø,Ø,Ø,Ø,2
33Ø DATA 4,4,4,1,4,4,4,4
34Ø DATA 4,4,4,4,4,4,4,4
35Ø DATA 4,Ø,Ø,Ø,4,Ø,4,4
36Ø DATA 4,Ø,4,Ø,Ø,Ø,Ø,Ø
37Ø DATA Ø,Ø,4,Ø,4,Ø,4,4
38Ø DATA 3,Ø,4,Ø,Ø,Ø,4,4
39Ø DATA 4,Ø,4,Ø,Ø,Ø,Ø,2
4ØØ DATA 4,Ø,4,1,4,4,4,4
41Ø DATA 4,4,4,4,4,4,4,4
42Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
43Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
44Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
45Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
46Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
47Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
48Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
49Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
5ØØ DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
51Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
52Ø DATA 62,Ø,Ø,25Ø,58,Ø,Ø,171
53Ø DATA 42,Ø,Ø,163,58,Ø,Ø,135
54Ø DATA 54,Ø,Ø,147,5Ø,Ø,Ø,167
55Ø DATA 58,Ø,Ø,171,58,Ø,Ø,17Ø
56Ø DATA 62,Ø,Ø,171,Ø,Ø,Ø,16Ø
57Ø DATA 254,17Ø,17Ø,25Ø,7Ø,17Ø,
17Ø,164
58Ø DATA 19,168,17Ø,177,71,33,42
,18Ø
59Ø DATA 19,52,74,49,71,49,18,52
6ØØ DATA 19,52,71,49,71,33,19,52
61Ø DATA 255,42,255,63,Ø,Ø,Ø,Ø
62Ø DATA 85,85,87,234,253,87,212
,7Ø
63Ø DATA 255,87,245,18,255,223,2
```

```
44,7Ø
64Ø DATA 255,255,245,19,Ø,Ø,52,7
1
65Ø DATA Ø,Ø,53,19,Ø,Ø,52,71
66Ø DATA Ø,Ø,55,255,Ø,Ø,52,Ø
67Ø DATA Ø,Ø,55,63,Ø,Ø,55,52
68Ø DATA Ø,Ø,55,49,Ø,Ø,55,52
69Ø DATA Ø,Ø,55,49,Ø,Ø,247,52
7ØØ DATA 247,255,215,49,213,255,
215,52
71Ø DATA 85,127,87,63,85,85,84,Ø
72Ø DATA 43,21,85,85,33,21,253,8
7
73Ø DATA 55,23,255,87,51,23,255,
223
74Ø DATA 52,23,255,255,17,2Ø,Ø,Ø
75Ø DATA 52,2Ø,Ø,Ø,49,2Ø,Ø,Ø
76Ø DATA 63,2Ø,Ø,Ø,Ø,2Ø,Ø,Ø
77Ø DATA 254,2Ø,Ø,Ø,7Ø,2Ø,Ø,Ø
78Ø DATA 18,2Ø,Ø,Ø,71,2Ø,Ø,Ø
79Ø DATA 19,2Ø,Ø,Ø,71,23,Ø,Ø
8ØØ DATA 18,23,247,255,7Ø,21,213
,255
81Ø DATA 234,21,85,127,Ø,21,85,8
5
82Ø DATA 43,25Ø,62,191,33,21Ø,52
,71
83Ø DATA 55,7Ø,49,19,51,18,52,71
84Ø DATA 52,69,49,19,17,17,2Ø,69
85Ø DATA 52,69,33,17,49,18,36,7Ø
86Ø DATA 63,17Ø,43,25Ø,Ø,Ø,Ø,Ø
87Ø DATA 254,42,191,63,7Ø,49,19,
52
88Ø DATA 18,52,71,49,71,17,19,52
89Ø DATA 19,2Ø,2Ø7,49,71,17,55,5
2
9ØØ DATA 18,36,118,49,7Ø,33,21Ø,
36
91Ø DATA 234,47,254,42,Ø,Ø,Ø,Ø
92Ø DATA 2,128,1Ø,16Ø,17Ø,17Ø,25
5,24Ø
93Ø DATA 63,48,63,252,31,255,23,
24Ø
94Ø DATA 87,224,85,84,21,85,85,8
5
95Ø DATA 17Ø,17Ø,4Ø,4Ø,4Ø,4Ø,4Ø,
4Ø
96Ø DATA 42,42,48,224,51,96,53,2
24
97Ø DATA 46,96,51,96,51,95,53,22
3
98Ø DATA 46,95,51,95,48,223,59,1
5Ø
99Ø DATA 47,6,52,1Ø,59,156,54,13
Ø
1ØØØ DATA 57,2,59,134,59,134,57,
2
1Ø1Ø DATA 57,28,53,241,58,241,58
```

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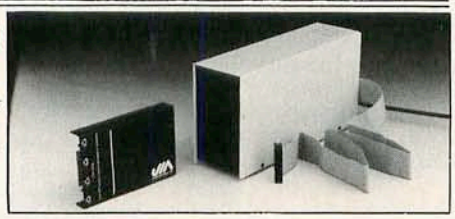

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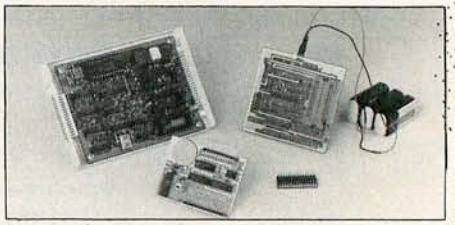

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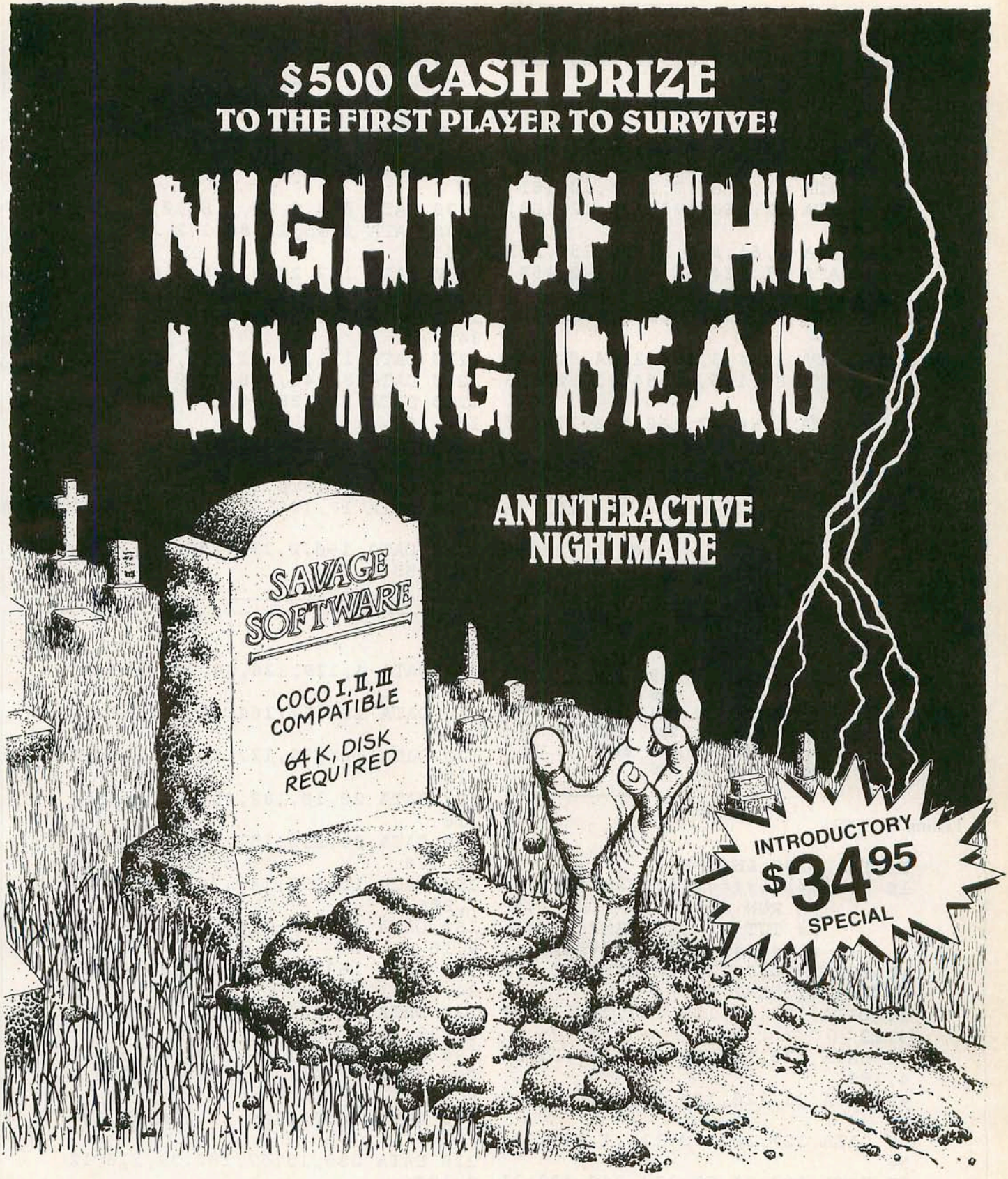

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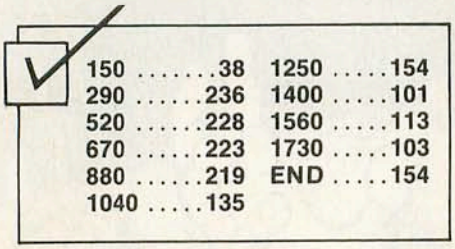
```
,249
1Ø2Ø DATA 61,1Ø9,58,237,255,255,
255,255
1Ø3Ø DATA 255,255,Ø,Ø,63,252,31,
244
1Ø4Ø DATA 19,196,6,144,8,32,32,8
1Ø5Ø DATA 32,8,8,32,6,144,Ø,Ø
1Ø6Ø DATA 21,4,5,17,1,65,1Ø,161
1Ø7Ø DATA 42,168,17Ø,17Ø,42,168,
1Ø,16Ø
1Ø8Ø DATA 1,64,Ø,Ø,2,128,255,255
1Ø9Ø DATA 61,124,61,124,182,158,
189,126
11ØØ DATA 63,252,63,252,255,255,
4,16
111Ø DATA 1,64,3,192,1,64,5,144
112Ø DATA 86,165,85,84,21,8Ø,5,6
4
113Ø DATA 1,64,42,168,17Ø,17Ø,15
7,222
114Ø DATA 42,168,1Ø,16Ø,255,255,
36,24
115Ø DATA 36,24,36,24,255,255,16
Ø,1Ø
116Ø DATA 168,42,41,1Ø4,43,232,9
,96
117Ø DATA 9,96,Ø,64,Ø,16,4,64
118Ø DATA 1,Ø,5,8Ø,31,244,7,253
119Ø DATA 1,244,Ø,8Ø,1,66,5,3
12ØØ DATA 1,65,1,69,Ø,85,4,16
121Ø DATA 17,132,67,193,7,2Ø8,17
,68
122Ø DATA 67,193,7,2Ø8,17,68,66,
33
123Ø DATA Ø,Ø,Ø,2Ø,Ø,85,Ø,117
124Ø DATA Ø,85,21,85,172,213,17Ø
,165
125Ø DATA 187,2Ø,21,8Ø,5,64,168,
21
126Ø DATA 8,17,4Ø,8Ø,32,64,131,2
34
127Ø DATA 171,194,1,8,5,4Ø,68,32
128Ø DATA 84,42,2,Ø,3,4Ø,11,188
129Ø DATA 11,238,46,172,187,188,
175,166
13ØØ DATA 126,224,126,192,24,Ø,Ø
,4
131Ø DATA Ø,18,Ø,18,1,18,1,42
132Ø DATA 17,168,18,128,26,Ø,168
,Ø
133Ø DATA 16Ø,Ø,255,255,255,255,
255,255
```



Listing 3: 3PART1

```
5 CLEAR 1ØØ,&H4FFE
1Ø REM ########################
       ## RUN after LOADING  ##
       ## TUT 1  SEE TEXT    ##
       ########################
15 FOR X=2Ø479 TO 21959:READ DT:
POKE X,DT:NEXT X
2Ø DATA 189,18,119,189,23,112,18
9,23
3Ø DATA 135,189,38,229,189,23,17
4,189
4Ø DATA 23,22Ø,189,24,5,189,24,9
3
5Ø DATA 127,3Ø,25Ø,134,1,183,31,
54
6Ø DATA 183,31,55,134,24Ø,183,31
,24
7Ø DATA 189,25,3,189,24,112,189,
25
8Ø DATA 2ØØ,189,27,14,189,27,9Ø,
189
9Ø DATA 18,92,182,255,Ø,129,254,
39
1ØØ DATA 4,129,126,38,245,189,37
,76
11Ø DATA 189,37,164,189,38,82,18
9,38
12Ø DATA 125,79,177,3Ø,237,38,19
,189
13Ø DATA 2Ø,1Ø,182,255,Ø,129,254
,16
14Ø DATA 39,255,157,129,126,38,2
43,126
15Ø DATA 15,255,189,26,19Ø,189,3
7,2Ø6
16Ø DATA 189,28,11Ø,189,29,35,18
9,16
17Ø DATA 162,189,16,152,189,3Ø,1
24,189
18Ø DATA 25,2ØØ,189,23,174,189,3
6,235
19Ø DATA 16,142,Ø,Ø,49,33,16,14Ø
2ØØ DATA 9,196,39,2,32,246,126,1
6
21Ø DATA 68,79,189,25,228,57,128
,184
22Ø DATA 255,15,57,182,39,116,12
9,18Ø
23Ø DATA 36,7,139,6Ø,183,39,116,
32
24Ø DATA 3,127,39,116,189,29,1Ø9
,57
25Ø DATA 57,255,255,255,255,255,
255,255
```

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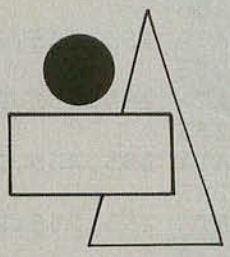

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```
26Ø DATA 255,Ø,Ø,Ø,Ø,Ø,Ø,Ø
27Ø DATA Ø,Ø,Ø,Ø,Ø,134,128,184
28Ø DATA 255,15,182,255,15,183,4
,Ø
29Ø DATA 32,243,Ø,Ø,Ø,Ø,Ø,Ø
3ØØ DATA Ø,Ø,Ø,Ø,4,Ø,Ø,Ø
31Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
32Ø DATA 4,Ø,Ø,Ø,Ø,Ø,Ø,Ø
33Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
34Ø DATA 83,251,255,255,255,255,
255,255
35Ø DATA 255,255,255,255,255,255
,255,255
36Ø DATA 255,255,255,255,255,255
,255,255
37Ø DATA 255,255,255,255,255,255
,255,255
38Ø DATA 255,255,255,255,255,255
,255,255
39Ø DATA 255,255,255,255,255,255
,255,255
4ØØ DATA 255,255,255,255,255,255
,255,255
41Ø DATA 255,255,255,255,255,255
,255,255
42Ø DATA 255,Ø,Ø,Ø,Ø,Ø,Ø,Ø
43Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
44Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
45Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
46Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
47Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
48Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
49Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
5ØØ DATA 35,255,255,255,255,255,
255,255
51Ø DATA 255,255,255,255,255,255
,255,255
52Ø DATA 255,255,255,255,255,189
,21,224
53Ø DATA 189,21,224,189,21,224,1
27,255
54Ø DATA 2Ø1,127,255,34,127,255,
2Ø2,127
55Ø DATA 255,2Ø6,127,255,192,127
,255,194
56Ø DATA 127,255,196,142,17,248,
16,142
57Ø DATA 4,Ø,95,166,128,167,16Ø,
92
58Ø DATA 193,78,39,2,32,245,182,
3Ø
59Ø DATA 22Ø,139,48,183,4,78,182
,3Ø
6ØØ DATA 221,139,48,183,4,79,182
,3Ø
61Ø DATA 222,139,48,183,4,8Ø,182
,3Ø
62Ø DATA 223,139,48,183,4,81,134
,48
63Ø DATA 183,4,82,127,15,16Ø,57,
4
64Ø DATA 4,Ø,Ø,Ø,Ø,Ø,Ø,Ø
65Ø DATA Ø,3,15,14,7,18,1,2Ø
66Ø DATA 21,12,1,2Ø,9,15,14,19
67Ø DATA 32,25,15,21,32,1,18,5
68Ø DATA 32,2Ø,8,5,32,32,32,32
69Ø DATA 32,19,15,12,5,32,19,21
7ØØ DATA 18,22,9,22,15,18,32,32
71Ø DATA 32,32,32,32,32,32,32,32
72Ø DATA 32,32,32,32,32,32,32,32
73Ø DATA 32,25,15,21,18,32,19,3
74Ø DATA 15,18,5,32,9,19,32,Ø
75Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
76Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
77Ø DATA Ø,Ø,Ø,Ø,Ø,134,255,183
78Ø DATA 43,196,183,43,197,183,4
3,198
79Ø DATA 183,43,199,183,43,164,1
83,43
8ØØ DATA 165,183,43,166,183,43,1
67,57
81Ø DATA 182,15,16Ø,129,1ØØ,38,1
ØØ,182
82Ø DATA 3Ø,22Ø,177,3Ø,23Ø,34,32
,37
83Ø DATA 54,182,3Ø,221,177,3Ø,23
1,34
84Ø DATA 22,37,44,182,3Ø,222,177
,3Ø
85Ø DATA 232,34,12,37,34,182,3Ø,
223
86Ø DATA 177,3Ø,233,34,2,32,24,1
82
87Ø DATA 3Ø,22Ø,183,3Ø,23Ø,182,3
Ø,221
88Ø DATA 183,3Ø,231,182,3Ø,222,1
83,3Ø
89Ø DATA 232,182,3Ø,223,183,3Ø,2
33,189
9ØØ DATA 21,224,189,21,224,134,3
,183
91Ø DATA 3Ø,237,182,15,161,183,3
Ø,22Ø
92Ø DATA 182,15,162,183,3Ø,221,1
82,15
93Ø DATA 163,183,3Ø,222,182,15,1
64,183
94Ø DATA 3Ø,223,57,63,4,Ø,Ø,Ø
95Ø DATA Ø,Ø,4,Ø,4,Ø,4,Ø
96Ø DATA 4,Ø,Ø,Ø,Ø,Ø,Ø,Ø
97Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
98Ø DATA 194,251,255,255,255,255
,255,255
99Ø DATA 255,187,185,197,161,222
,7,255
1ØØØ DATA 82,161,197,11,Ø,Ø,171,
238
1Ø1Ø DATA 161,181,1,2,221,161,16
1,2
1Ø2Ø DATA 4,16Ø,24Ø,Ø,255,255,25
5,255
1Ø3Ø DATA 255,255,255,255,255,25
```

```
5,255,255
1Ø4Ø DATA 255,255,255,255,255,25
5,255,255
1Ø5Ø DATA 255,255,255,255,255,25
5,255,255
1Ø6Ø DATA 255,Ø,Ø,Ø,Ø,Ø,Ø,Ø
1Ø7Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
1Ø8Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
1Ø9Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
11ØØ DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
111Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
112Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
113Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
114Ø DATA 193,255,255,255,255,25
5,74,32
115Ø DATA 32,255,255,255,255,255
,255,255
116Ø DATA 255,255,255,255,255,25
5,255,255
117Ø DATA 255,255,255,255,255,25
5,255,255
118Ø DATA 255,255,255,255,255,25
5,255,255
119Ø DATA 255,255,255,255,255,25
5,255,255
12ØØ DATA 255,255,255,255,255,25
5,255,255
121Ø DATA 255,255,255,255,255,25
5,255,255
122Ø DATA 255,Ø,Ø,Ø,Ø,Ø,Ø,Ø
123Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,28,185
124Ø DATA 187,185,197,162,3Ø,13,
185,236
125Ø DATA 187,185,197,189,51,177
,1Ø6,Ø
126Ø DATA 188,225,183,77,174,84,
173,45
127Ø DATA 173,196,Ø,Ø,Ø,Ø,Ø,85
128Ø DATA 85,85,85,85,85,85,85,8
5
129Ø DATA 85,85,85,85,85,85,85,8
5
13ØØ DATA 85,85,85,85,85,85,85,8
5
131Ø DATA 85,85,85,142,42,77,134
,13
132Ø DATA 189,23,148,142,42,78,1
34,19
133Ø DATA 189,23,148,142,42,79,1
34,2Ø
134Ø DATA 189,23,148,142,42,8Ø,1
34,21
135Ø DATA 189,23,148,142,42,82,1
34,22
136Ø DATA 189,23,148,142,42,83,1
34,23
137Ø DATA 189,23,148,142,42,84,1
34,24
138Ø DATA 189,23,148,142,42,85,1
34,25
139Ø DATA 189,23,148,57,7Ø,68,32
```

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```
,13
14ØØ DATA Ø,198,3Ø,247,2Ø,179,13
4,255
141Ø DATA 16,142,Ø,15,189,23,51,
246
142Ø DATA 2Ø,179,9Ø,193,1,39,5,2
47
143Ø DATA 2Ø,179,32,234,57,Ø,Ø,Ø
144Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
145Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
146Ø DATA Ø,118,255,255,255,255,
255,255
147Ø DATA 255,255,255,255,255,25
5,255,255
148Ø DATA 255,255,255,255,255,25
5,255,255
149Ø DATA 255,255,255,255,255,25
5,255,255
15ØØ DATA 255,255,255,255,255,25
5,255,84
151Ø DATA 85,84,84,69,84,85,84,6
6
152Ø DATA 13,13,13,32,2,191,21,2
2
153Ø DATA 142,36,14,16,142,Ø,2,1
34
154Ø DATA 255,23Ø,132,189,23,51,
48,1
155Ø DATA 14Ø,36,33,46,2,32,236,
19Ø
156Ø DATA 21,22,57,Ø,Ø,Ø,Ø,Ø
157Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
158Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
159Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
16ØØ DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
161Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
162Ø DATA Ø,25,255,255,255,255,2
55,255
163Ø DATA 255,255,255,255,255,25
5,255,255
164Ø DATA 255,255,255,255,255,25
5,255,58
165Ø DATA 4Ø,16,142,Ø,Ø,49,33,16
166Ø DATA 14Ø,15,16Ø,38,248,57,1
98,5Ø
167Ø DATA 16,142,Ø,4Ø,189,23,51,
134
168Ø DATA 255,198,3Ø,16,142,Ø,2Ø
,189
169Ø DATA 23,51,57,12Ø,246,21,11
9,9Ø
17ØØ DATA 193,3Ø,37,5,247,21,119
,32
171Ø DATA 223,57,Ø,16,142,31,49,
189
172Ø DATA 37,37,57,Ø,Ø,Ø,Ø,Ø
173Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
174Ø DATA 5,185,161,161,222,7,25
5,82
175Ø DATA 161,197,11,Ø,Ø,171,238
,161
```

```
176Ø DATA 181,1,2,221,161,161,2,
4
177Ø DATA 3Ø,Ø,79,Ø,Ø,Ø,Ø,Ø
178Ø DATA 27,255,255,255,255,255
,255,255
179Ø DATA 255,255,255,255,255,83
,84,69
18ØØ DATA 83,84,7Ø,7Ø,7Ø,7Ø,7Ø,8
4
181Ø DATA 85,84,66,65,83,73,67,6
7
182Ø DATA 67,67,67,67,67,67,67,6
7
183Ø DATA 67,67,67,67,67,67,255,
134
184Ø DATA 255,198,5Ø,16,142,Ø,23
Ø,189
185Ø DATA 23,51,134,255,198,25,1
6,142
186Ø DATA Ø,115,189,23,51,134,25
5,198
187Ø DATA 5Ø,16,142,Ø,23Ø,189,23
,51
```

```
270 .....4
530 .....234
760 .....154
950 .....183
1150 .....221
END .....252
```

Listing 4: 3PART2

```
5 CLEAR 1ØØ,&H4FFE
1Ø REM ########################
       ## RUN AFTER LOADING  ##
       ## 3PART1  SEE TEXT   ##
       ########################
15 FOR X=24584 TO 25634:READ DT:
POKE X,DT:NEXT X
2Ø DATA 4,4,4,4,4,4,4,4
3Ø DATA 4,4,Ø,Ø,Ø,Ø,Ø,4
4Ø DATA 4,Ø,Ø,Ø,Ø,Ø,Ø,4
5Ø DATA Ø,Ø,Ø,4,1,4,Ø,4
6Ø DATA 4,Ø,Ø,Ø,Ø,Ø,Ø,4
7Ø DATA 4,Ø,4,4,Ø,Ø,Ø,Ø
8Ø DATA 3,Ø,4,3,Ø,Ø,Ø,4
9Ø DATA 4,4,4,4,4,4,4,4
1ØØ DATA 4,4,4,4,4,4,4,4
11Ø DATA 4,Ø,Ø,Ø,Ø,Ø,Ø,Ø
12Ø DATA 4,Ø,1,Ø,4,Ø,Ø,4
13Ø DATA 4,Ø,4,Ø,4,4,Ø,4
14Ø DATA 4,Ø,4,Ø,Ø,3,Ø,4
15Ø DATA Ø,Ø,4,Ø,4,4,Ø,4
16Ø DATA 4,Ø,Ø,Ø,2,4,Ø,4
17Ø DATA 4,4,4,4,4,4,4,4
18Ø DATA 4,4,4,4,4,4,4,4
19Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,4
2ØØ DATA 4,4,Ø,4,4,4,Ø,4
21Ø DATA 4,Ø,Ø,Ø,Ø,Ø,Ø,4
22Ø DATA 3,Ø,4,1,4,Ø,4,4
23Ø DATA 4,Ø,4,4,Ø,Ø,4,4
24Ø DATA 4,Ø,3,Ø,Ø,Ø,Ø,Ø
25Ø DATA 4,4,4,4,4,4,4,4
26Ø DATA 4,4,4,4,4,4,4,4
27Ø DATA 4,Ø,4,4,Ø,Ø,Ø,2
28Ø DATA 4,Ø,2,4,Ø,Ø,Ø,4
29Ø DATA 4,Ø,4,4,Ø,Ø,Ø,4
3ØØ DATA 4,Ø,4,Ø,Ø,Ø,Ø,Ø
31Ø DATA 4,Ø,Ø,Ø,4,1,4,4
32Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,4,4
33Ø DATA 4,4,4,4,4,4,4,4
34Ø DATA 4,4,4,4,4,4,4,4
35Ø DATA 4,Ø,2,4,Ø,Ø,Ø,4
36Ø DATA 4,Ø,4,4,Ø,4,Ø,4
37Ø DATA 4,Ø,4,4,Ø,4,Ø,4
38Ø DATA Ø,Ø,4,4,Ø,4,Ø,4
39Ø DATA 4,Ø,Ø,Ø,Ø,4,Ø,4
4ØØ DATA 3,Ø,Ø,Ø,Ø,4,Ø,4
41Ø DATA 4,4,4,4,1,4,4,4
42Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
43Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
44Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
45Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
46Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
47Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
48Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
49Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
5ØØ DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
51Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
52Ø DATA 62,Ø,Ø,25Ø,58,Ø,Ø,171
53Ø DATA 42,Ø,Ø,163,58,Ø,Ø,135
54Ø DATA 54,Ø,Ø,147,5Ø,Ø,Ø,167
55Ø DATA 58,Ø,Ø,171,58,Ø,Ø,17Ø
56Ø DATA 62,Ø,Ø,171,Ø,Ø,Ø,16Ø
57Ø DATA 254,17Ø,17Ø,25Ø,7Ø,17Ø,
17Ø,164
58Ø DATA 19,168,17Ø,177,71,33,42
,18Ø
59Ø DATA 19,52,74,49,71,49,18,52
6ØØ DATA 19,52,71,49,71,33,19,52
61Ø DATA 255,42,255,63,Ø,Ø,Ø,Ø
62Ø DATA 85,85,87,234,253,87,212
,7Ø
63Ø DATA 255,87,245,18,255,223,2
44,7Ø
64Ø DATA 255,255,245,19,Ø,Ø,52,7
```

```
1
65Ø DATA Ø,Ø,53,19,Ø,Ø,52,71
66Ø DATA Ø,Ø,55,255,Ø,Ø,52,Ø
67Ø DATA Ø,Ø,55,63,Ø,Ø,55,52
68Ø DATA Ø,Ø,55,49,Ø,Ø,55,52
69Ø DATA Ø,Ø,55,49,Ø,Ø,247,52
7ØØ DATA 247,255,215,49,213,255,
215,52
71Ø DATA 85,127,87,63,85,85,84,Ø
72Ø DATA 43,21,85,85,33,21,253,8
7
73Ø DATA 55,23,255,87,51,23,255,
223
74Ø DATA 52,23,255,255,17,2Ø,Ø,Ø
75Ø DATA 52,2Ø,Ø,Ø,49,2Ø,Ø,Ø
76Ø DATA 63,2Ø,Ø,Ø,Ø,2Ø,Ø,Ø
77Ø DATA 254,2Ø,Ø,Ø,7Ø,2Ø,Ø,Ø
78Ø DATA 18,2Ø,Ø,Ø,71,2Ø,Ø,Ø
79Ø DATA 19,2Ø,Ø,Ø,71,23,Ø,Ø
8ØØ DATA 18,23,247,255,7Ø,21,213
,255
81Ø DATA 234,21,85,127,Ø,21,85,8
5
82Ø DATA 43,25Ø,62,191,33,21Ø,52
,71
83Ø DATA 55,7Ø,49,19,51,18,52,71
84Ø DATA 52,69,49,19,17,17,2Ø,69
85Ø DATA 52,69,33,17,49,18,36,7Ø
86Ø DATA 63,17Ø,43,25Ø,Ø,Ø,Ø,Ø
87Ø DATA 254,42,191,63,7Ø,49,19,
52
88Ø DATA 18,52,71,49,71,17,19,52
89Ø DATA 19,2Ø,2Ø7,49,71,17,55,5
2
9ØØ DATA 18,36,118,49,7Ø,33,21Ø,
36
91Ø DATA 234,47,254,42,Ø,Ø,Ø,Ø
92Ø DATA 2,128,1Ø,16Ø,17Ø,17Ø,25
5,24Ø
93Ø DATA 63,48,63,252,31,255,23,
24Ø
94Ø DATA 87,224,85,84,21,85,85,8
5
95Ø DATA 17Ø,17Ø,4Ø,4Ø,4Ø,4Ø,4Ø,
4Ø
96Ø DATA 42,42,51,96,56,96,46,96
97Ø DATA 58,224,53,224,56,95,46,
95
98Ø DATA 58,223,53,223,58,219,59
,142
99Ø DATA 54,15Ø,54,13Ø,49,136,47
,8
1ØØØ DATA 59,13Ø,59,144,59,138,4
7,28
```

```
1Ø1Ø DATA 59,13Ø,51,113,48,233,5
3,237
1Ø2Ø DATA 56,117,61,113,255,255,
255,255
1Ø3Ø DATA 255,255,Ø,Ø,63,252,31,
244
1Ø4Ø DATA 19,196,6,144,8,32,32,8
1Ø5Ø DATA 32,8,8,32,6,144,Ø,Ø
1Ø6Ø DATA 21,4,5,17,1,65,1Ø,161
1Ø7Ø DATA 42,168,17Ø,17Ø,42,168,
1Ø,16Ø
1Ø8Ø DATA 1,64,Ø,Ø,2,128,255,255
1Ø9Ø DATA 61,124,61,124,182,158,
189,126
11ØØ DATA 63,252,63,252,255,255,
4,16
111Ø DATA 1,64,3,192,1,64,5,144
112Ø DATA 86,165,85,84,21,8Ø,5,6
4
113Ø DATA 1,64,42,168,17Ø,17Ø,15
7,222
114Ø DATA 42,168,1Ø,16Ø,255,255,
36,24
115Ø DATA 36,24,36,24,255,255,16
Ø,1Ø
116Ø DATA 168,42,41,1Ø4,43,232,9
,96
117Ø DATA 9,96,Ø,64,Ø,16,4,64
118Ø DATA 1,Ø,5,8Ø,31,244,7,253
119Ø DATA 1,244,Ø,8Ø,1,66,5,3
12ØØ DATA 1,65,1,69,Ø,85,4,16
121Ø DATA 17,132,67,193,7,2Ø8,17
,68
122Ø DATA 67,193,7,2Ø8,17,68,66,
33
123Ø DATA Ø,Ø,Ø,2Ø,Ø,85,Ø,117
124Ø DATA Ø,85,21,85,172,213,17Ø
,165
125Ø DATA 187,2Ø,21,8Ø,5,64,168,
21
126Ø DATA 8,17,4Ø,8Ø,32,64,131,2
34
127Ø DATA 171,194,1,8,5,4Ø,68,32
128Ø DATA 84,42,2,Ø,3,4Ø,11,188
129Ø DATA 11,238,46,172,187,188,
175,166
13ØØ DATA 126,224,126,192,24,Ø,Ø
,4
131Ø DATA Ø,18,Ø,18,1,18,1,42
132Ø DATA 17,168,18,128,26,Ø,168
,Ø
133Ø DATA 16Ø,Ø,255,255,255,255,
255,255
```

NOVICES NICHE

THE RAINBOW is a teaching environment and we realize that the majority of our readers will always be beginners. In our continuing effort to always keep the new user in mind, and in addition to the many beginner feature articles and programs published in every issue, "Novices Niche" contains shorter BASIC program listings that entertain as well as help the new user gain expertise in all aspects of the Color Computer: graphics, music, games, utilities, education, programming, etc.

Game Utility

Seeking Immortality

16K
Disk

By Paul Alger

Do you have some older video games for your CoCo that you have never completed, or games with graphics screens you've never even seen before? Fear not, gamester, for now your character will live long enough to reach the trail's end.

Immortality Finder is a game utility that will help you find the elusive "immortality poke" for most video games. This poke is the memory location that holds the number of "men" you start with on a given game. If you poke this location with, say, a value of 255, then you start off the game with 255 men!

Immortality Finder works on the principle that most machine language game programmers load the number of men using an LDA or LDB command when the game is initialized. *Immortality Finder* checks the ML code for all LDAs and LDBs. It then checks the value that is loaded into the A or B register. If the value is close to the number of men you start with, that location becomes a possible immortality poke.

It's easy to use the program. Just run and enter the filename and extension of the game you want to search. The program asks how many men the game starts with. Enter that number, insert the game disk and wait for *Immortality Finder* to complete the search. When the search is complete, you have the option to print the list of possible locations to the screen or to the printer. The list gives *all* of the possible immortality poke locations.

To test a poke, first load your game, poke the location with the number of men you want, and then EXEC. For example, if you run *Immortality Finder* on last month's *Tut's Tomb* (July 1988 RAINBOW, Page 58), you will get a printout of nine possible locations. The first is Location 6979. In this example, we type the following:

```
LOADM "TUT1.BIN"
POKE 6979,255
EXEC
```

After giving this poke a test run, we discover — lo and behold — that it works! In fact, it gives us 255 "men" instead of three. But if Location 6979 *didn't* work, we would run the process again for the next location on the list, which happens to be Location 7090. And on and on, until we found one that did work.

Immortality Finder will not work for all games, however. Game candidates must be in RS DOS, start with a specific number of men, and fit into memory with the *Immortality Finder* program. Here are some of the games I have found to work successfully with the program: *Shock Trooper, Crash, Ninja Warrior* and *Gold Runner.*

Remember, immortality comes at a price: Gamesters who partake of the waters of immortality should not submit their immortal scores to RAINBOW's Scoreboard.

The listing: IMMORTAL

```
Ø GOTO9Ø
5 CLEAR2ØØ,&H2ØØØ:DIMA(5Ø),B(5Ø)
:CLS:PRINT"IMORTALITY FINDER":PR
INT"BY PAUL ALGER":PRINT
1Ø PRINT"ENTER FILENAME/EXT: ";:
LINEINPUTFI$:INPUT"HOW MANY MEN
DO YOU START WITH";C1:PRINT"INSE
RT DISK WITH "FI$" AND HIT ENTER
. ";:LINEINPUTZ$
15 OPEN"D",#1,FI$,1:IF LOF(1)=Ø
THEN CLOSE:KILL FI$:RUN
2Ø FIELD#1,1 AS A$:B=LOF(1):FORQ
=1TO5:GET#1,Q:C(Q)=ASC(A$):NEXTQ
:CLOSE:ST=(C(4)*256+C(5)):LG=(C(
2)*256+C(3)):ED=ST+LG:OF=&H2ØØØ-
ST:IF OF<1THENOF=Ø
25 IF OF+ED>&H8ØØØ THENPRINT"WHE
```

```
N IO ERROR OCCURS, TYPE:":PRINT"
GOTO35
3Ø LOADMFI$,OF
35 CLS(3):PRINT@5,"FILENAME:";:P
RINT@16,FI$;
4Ø PRINT@66,"START";:PRINT@73,US
ING"#####";ST;:PRINT@66+64,"END
 ";:PRINT@73+64,USING"#####";ED;
:PRINT@66+32,"NOW  ";:PRINT@73+3
2,USING"#####";M;
45 PRINT@81,"LDA'S ";:PRINT@89,U
SING"####";LA;:PRINT@81+32,"LDB'
S ";:PRINT@89+32,USING"####";LB;
:PRINT@81+64,"POKES ";:PRINT@89+
64,USING"####";Ø;
5Ø FOR M=ST+OF TO ED+OF
55 FORM=ST+OF TO ED+OF:PRINT@1Ø5
,USING"#####";M-OF;
6Ø IF PEEK(M)=&H86 THEN LA=LA+1:
PRINT@89,USING"####";LA;:IF PEEK
(M+1)=C1 OR PEEK(M+1)=C1+1THEN L
=L+1:A(L)=M-OF:PRINT@153,USING"#
###";L+L1;
65 IF PEEK(M)=&HC6 THEN LB=LB+1:
PRINT@121,USING"####";LB;:IF PEE
K(M+1)=C1 OR PEEK(M)=C1+1 THEN L
1=L1+1:B(L1)=M-OF:PRINT@153,USIN
G"####";L+L1;
7Ø NEXT:PRINT@321," ";:INPUT"DON
E... HIT ENTER TO PRINT";Z$
75 CLS:PRINT"PRINT TO [S]CREEN O
R [P]RINTER.":PRINT"(ENTER P OR
S) ";:LINEINPUTZ$:IFZ$="P"THEND=
2ELSED=Ø
8Ø PRINT#-D,"FILENAME: ";FI$:PRI
NT#-D,"DECIMAL","HEX":FORX=1TOL:
PRINT#-D,A(X)+1,HEX$(A(X)+1):NEX
T:FORX=1TOL1:PRINT#-D,B(X)+1,HEX
$(B(X)+1):NEXT
85 PRINT"HIT ENTER TO PRINT AGAI
N.":LINEINPUTZ$:GOTO75
9Ø PCLEAR1:GOTO5
```

Arcade

Minding Your X's and Y's

16K ECB

By James Kevin Lowry

You have two eyes, so you'd think you'd be able to see two things at once. Frogs can, sort of. With *JoyZap*, you had better train your eyes to be ambidextrous or be very quick.

JoyZap is a shoot-'em-up with a twist — you don't aim at your target using a "hairline" cursor; you use *guides*, points on the *x*- and *y*-axes. When you boot up *JoyZap*, the two axes are drawn and the space they enclose begins to fill randomly with blocks. Your joystick position is tracked on the axes, and your mission is to lock on to the points that define a target and press the firebutton. Red blocks are worth 20 points; blue, 10; white, 5. Be careful: If you don't hit the block squarely, hitting an adjacent space instead, the block will become green and worth only one point.

Delete Line 40 if your computer cannot handle the high-speed poke.

The listing: JOYZAP

```
1Ø CLS:PRINT@172,"JOYZAP":PRINT@
48Ø,"COPYRIGHT 1987 JKL JAMES K
LOWRY":FOR Z=1 TO 15ØØ:NEXTZ
4Ø POKE 65495,Ø
5Ø CLS(Ø)
6Ø S=Ø:SC=Ø
7Ø PRINT@48Ø,"HITS="S"  SCORE="S
C;
8Ø FOR B=Ø TO 63:SET(B,Ø,3):NEXT
9Ø FOR C=Ø TO 27:SET(Ø,C,3):NEXT
1ØØ TIMER=Ø
11Ø Z=RND(2Ø):IF Z=1Ø THEN SET(R
ND(5Ø)+7,RND(12)+7,RND(3)+5)
12Ø X=JOYSTK(Ø):Y=JOYSTK(1)
13Ø IF X<2 THENX=2
14Ø IF Y<2 THEN Y=2
15Ø IF Y>27 THEN Y=27
16Ø SET (X,2,5):SET(2,Y,5)
17Ø RESET(X,2):RESET(2,Y)
18Ø IF TIMER>7ØØØ THEN GOTO 28Ø
19Ø IF BUTTON(Ø)=1 THEN GOTO 2ØØ
 ELSE GOTO 11Ø
2ØØ H=POINT(X,Y):IF H=6 THEN GOT
O 23Ø ELSE IF H=7 THEN GOTO 24Ø
ELSE IF H=8 THEN GOTO 25Ø ELSE I
F H=1 THEN GOTO 26Ø
21Ø SET(X,Y,1):SOUND 4Ø,5::RESET
 (X,Y)
22Ø GOTO 11Ø
23Ø GOSUB 27Ø:S=S+1:SC=SC+5:RESE
T(X,Y):PRINT@48Ø,"HITS="S" SCORE
="SC;:GOTO 11Ø
24Ø GOSUB 27Ø:S=S+1:SC=SC+1Ø:RES
ET(X,Y):PRINT@48Ø,"HITS="S" SCOR
E="SC;:GOTO 11Ø
25Ø GOSUB 27Ø:S=S+1:SC=SC+2Ø:RES
ET(X,Y):PRINT@48Ø,"HITS="S" SCOR
E="SC;:GOTO 11Ø
26Ø GOSUB 27Ø:S=S+1:SC=SC+1:RESE
T(X,Y):PRINT@48Ø,"HITS="S" SCORE
="SC;:GOTO 11Ø
27Ø SOUND2ØØ,2:SOUND185,4:RETURN
28Ø POKE65494,Ø
29Ø PRINT"AVERAGE="INT(SC/S):END
```

Space Attack

CoCo 3

By John T. Wells

To me, the most interesting type of game for home computers has always been the space shoot-'em-up. I wrote *EZShoot* to illustrate how easy it is to write and develop such a program.

In *EZShoot* you control a cannon's movement at the base of the screen with the left and right arrow keys. Using the space bar as a trigger, you shoot at spacecraft that fly above. For each direct hit, you score 10 points. The craft crosses the screen in uneven distance and timing spurts, so staying in one place and firing won't result in hits every time.

The listing: EZSHOOT

```
1 POKE65497,Ø:ON BRK GOTO 17
2 HSCREEN2:HBUFF1,19ØØ:HBUFF2,19
ØØ:HBUFF3,19ØØ:HCLS(8):HDRAW"C6;
BM1ØØ,5Ø;R1ØF5R5D2L5G5L1ØE6H6":H
PAINT(11Ø,55),6,6:HGET(1ØØ,5Ø)-(
145,85),1:HDRAW"C7;BM2ØØ,1ØØ;D4R
3D4L5U4R3U4":HPAINT(2Ø1,1Ø5),7,7
:HGET(19Ø,9Ø)-(235,125),2
3 SO$="T255;12;11":S1$="T255;O2;
12;11"
4 HCLS8
5 FOR T=1TO2ØØØ
6 HGET(1ØØ,1ØØ)-(15Ø,14Ø),3
7 X1=16Ø:Y1=17Ø:Y2=3Ø:SC=Ø
8 FOR C1=1 TO 2Ø:F1=3
9 RD=RND(3Ø):IF RD<15 THEN 9 ELS
E FOR X2=3Ø TO 27Ø STEP RD:HPUT(
X2,Y2)-(X2+44,Y2+28),1,PSET
1Ø II$=INKEY$:IF II$="" THEN II=
1Ø ELSEIF II$=" " THEN GOSUB 18
ELSE II=ASC(II$)
11 HPUT(X1,Y1)-(X1+5Ø,Y1+4Ø),3,P
SET
12 IF II=8 THEN X1=X1-16 ELSEIF
II=9 THEN X1=X1+16
13 HPUT(X1,Y1)-(X1+45,Y1+35),2,P
SET
14 HPUT(X2,Y2)-(X2+5Ø,Y2+4Ø),3,P
SET
15 NEXT X2
16 NEXT C1
17 HPRINT(1Ø,15),"AGAIN (Y/N) <E
NTER>? ":LINE INPUT AN$:IF AN$="
Y" THEN 4 ELSE POKE65496,Ø:END
18 F1=F1-1:IF F1<Ø THEN RETURN E
LSE PLAY SO$:FOR YY=Y1-1Ø TO Y2
STEP -3Ø:HSET(X1+1Ø,YY,1):IF HPO
INT(X1+9,YY)=6 OR HPOINT(X1+11,Y
Y)=6 THEN GOSUB2Ø ELSE HSET(X1+1
Ø,YY,8):NEXT
19 RETURN
2Ø HCIRCLE(X1+15,YY-2),1Ø,7:HPAI
NT(X1+1Ø,YY),7,7:FOR CT=1 TO 1Ø:
PLAYS1$:NEXT:HPUT(X1-2Ø,YY-2Ø)-(
X1+3Ø,YY+2Ø),3,PSET:SC=SC+1Ø:HPR
INT(1Ø,1),"SCORE":HCOLOR8,8:HPRI
NT(2Ø,1),SC-1Ø:HCOLOR7,8:HPRINT(
2Ø,1),SC:RETURN
```

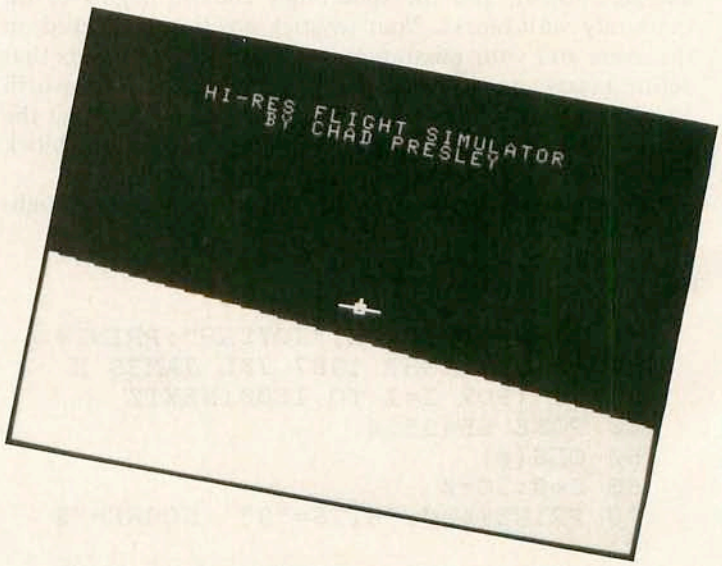
Simulation

Winging It

CoCo 3

By Chad Presley

Who would have thought that a CoCo 3 could take flight in so few lines of BASIC coding? Well, with this little flight simulator you can't do dogfights and you can't drop bombs, but you can experience the illusion that you are actually in the cockpit of a plane, diving and turning. Just plug in your right joystick and take to the air.



The listing: FLIGHT

```
1Ø ONBRKGOTO19Ø
2Ø REM  HI-RES FLIGHT SIMULATOR
3Ø REM       BY CHAD PRESLEY
4Ø POKE65497,Ø:A=87:B=87
5Ø HSCREEN2:HCLS14:HCOLOR3
55 HCOLORØ:HLINE(Ø,1Ø+A)-(32Ø,1Ø
+B),PSET:HPAINT(Ø,1ØØ),Ø
```

```
6Ø HCOLOR1:HPRINT(8,Ø),"HI-RES F
LIGHT SIMULATOR":HPRINT(12,1),"B
Y CHAD PRESLEY":HCOLOR8:HLINE(Ø,
25)-(32Ø,25),PSET
7Ø H=JOYSTK(Ø):V=JOYSTK(1)
8Ø IFA=15THENA=A+1ELSEIFA=17ØTHE
NA=A-1
9Ø IFB=15THENB=B+1ELSEIFB=17ØTHE
NB=B-1
1ØØ IFH>43THENA=A-1
11Ø IFH<23THENA=A+1
12Ø IFV>43THENB=B+1
13Ø IFV<23THENB=B-1
14Ø HCOLORØ:HLINE(Ø,1Ø+A)-(32Ø,1
Ø+B),PSET
15Ø HCOLOR8:HLINE(Ø,9+A)-(32Ø,9+
B),PSET
16Ø HLINE(Ø,6+A)-(32Ø,6+B),PSET
17Ø HCOLOR4:HDRAW"BM17Ø,96;L2Ø;R
1Ø;U5":HCIRCLE(16Ø,96),3
18Ø SOUNDA+B/2,1:GOTO7Ø
19Ø POKE65496,Ø:END
```

Mind Game

4K

What's Missing?

By Keiran Kenny

You never miss something until it's gone, the saying goes. With this game you'll find it's hard to *remember* something when it's gone.

This program allows you to test and train your memory. After you have given the program a difficulty level as prompted (a range from two to 10), the screen displays rows of random letters, which you must study until you think you have them memorized. Then test yourself by pressing any key. One of the rows will disappear, and you will be asked to type in what you think it was. The computer will tell you if you are right or wrong and will keep track of your score.

The listing: MEMORY

```
1Ø CLS:GOTO3Ø
2Ø K$=INKEY$:IFK$=""THEN2ØELSERE
TURN
3Ø PRINT@4Ø,"<<<MEMORY>>>"
4Ø PRINT@96,"BY KEIRAN KENNY, TH
E HAGUE, 1987"
5Ø PRINT@192,"SET DIFFICIULTY LE
VEL:"
6Ø PRINT@26Ø,"";:INPUT"NO. OF RO
WS (2-1Ø):";NR
7Ø IFNR<2ORNR>1ØTHENPRINT@256,""
:GOTO6Ø
8Ø PRINT@324,"";:INPUT"NO. OF LE
TTERS (2-6):";NL
9Ø IFNL<2ORNL>6THENPRINT@324,"":
GOTO8Ø
1ØØ PRINT:PRINTTAB(6)"PRESS ANY
KEY.":GOSUB2Ø
11Ø CLS
12Ø P=34
13Ø FORN=1TONR
14Ø FORT=1TONL
15Ø R=64+RND(26)
16Ø A$=CHR$(R)
17Ø PRINT@P,A$;
18Ø B$=B$+A$
19Ø P=P+1
2ØØ NEXT
21Ø C$(N)=B$:B$=""
22Ø P=P+32-NL
23Ø NEXT
24Ø PL=PL+NR*NL
25Ø K$=INKEY$
26Ø P=32:PP=P*(NR+2)+2
27Ø PRINT@PP,"WHEN READY, PRESS
ANY KEY.":GOSUB2Ø
28Ø N=RND(NR)
29Ø IP=P*N:PRINT@IP,""
3ØØ PRINT@PP,"<ENTER> THE MISSIN
G ROW."
31Ø PRINT@IP,"";:INPUTD$
32Ø PRINT@IP+NL+3,"";:IFD$=C$(N)
THENPRINT"RIGHT!":RT=RT+NR*NL EL
SEPRINT"WRONG! IT WAS "CHR$(34)C
$(N)CHR$(34)
33Ø PRINT@PP,"SCORE:"RT;CHR$(8)"
! POSSIBLE:"PL;CHR$(8)"."
34Ø SC=SC+1:IFSC/5=INT(SC/5)THEN
PRINT@PP+64,"CHANGE DIFFICULTY L
EVEL? Y/N"ELSE39Ø
35Ø GOSUB2Ø
36Ø IFK$="Y"THENCLS:GOTO5Ø
37Ø IFK$="N"THENCLS:GOTO12Ø
38Ø GOTO35Ø
39Ø PRINT@PP+7Ø,"PRESS ANY KEY."
:GOSUB2Ø
4ØØ CLS:GOTO12Ø
```

Submissions to "Novices Niche" are welcome from everyone. We like to run a variety of short programs that can be typed in at one sitting and are useful, educational and fun. Keep in mind, although the short programs are limited in scope, many novice programmers find it enjoyable and quite educational to improve the software written by others.

Program submissions must be on tape or disk. We're sorry, but we cannot key in program listings. All programs should be supported by some editorial commentary, explaining how the program works. If your submission is accepted for publication, the payment rate will be established and agreed upon prior to publication.

Interpreting a newspaper delivery chart

Carrier's Collection Chart

By Steve Blyn
Rainbow Contributing Editor

Delivering newspapers and fliers for local stores is a popular way of earning money for many preteens and teen-agers in our area. They opt for this kind of job because it allows them to work close to their homes, and also affords them the opportunity to be "their own boss." One of the essentials these junior entrepreneurs soon discover is that it is vital to keep good records on their customers. This month's article presents a portion of a collection chart teens could use for their newspaper delivery routes.

Newspaper carriers ordinarily prepay for their newspapers. Of course, they pay a lower price than the one printed on the newspaper. Money is made both from tips and the difference in the amount that carriers pay and later receive for the newspapers. We are concerned with figuring out how to read such a chart and to determine how much money to collect.

There are only eight names on our sample collection list. (We would hope this represents only a small portion of a carrier's true list.) When using DATA statements of less than 10 elements, it is unnecessary to use a DIM statement. Line 40 is therefore able to read in the eight customer names, which are contained in the one DATA statement in Line 280. Line 80 prints these names on the screen. You can alter these to more creative or meaningful names in your program.

Line 50 asks for user input. The student may select a real or imaginary price for the newspaper. This becomes Variable W. Arbitrarily we decide to double the daily price to create a Sunday edition price, which becomes Variable SU.

We feel that this user input feature is a key element to the program; it can be used in various ways. You could insist that students select realistic prices, which could lead to a social studies discussion of newspaper pricing. For example, the 5-cent newspaper of my youth now costs 35 cents. On the other hand, you could encourage unrealistic price selections to create a greater variety of possible arithmetic examples.

Not all customers order the newspaper every day of the week. Some want delivery only on the weekdays, and some may want only the weekend editions or just the Sunday paper. Lines 100 through 140 offer five different sequences of delivery days customers may have to choose from. A plus sign indicates that the paper is ordered on that day. The delivery schedule for each customer is chosen randomly each time the program is run. This helps create interest and eliminates memorization.

The student's task is to compute the amount each customer owes him for the week. The correct answer is represented by Variable TT; the user's answer is represented by Variable Q. Line 200 asks the student to input an answer. Lines 210 through 230 then compare the two answers and inform the student whether or not the answer is correct.

After each example, the student presses ENTER to go on to the next example. After each set of eight, the student should press either the E key to end the program or the ENTER key to begin again.

Line 240 always prints the correct answer on the chart, whether or not it was answered correctly. You might care to examine the chart with the student at the end of each set of eight examples. You might, for example, ask which customer owes the most or the least amount of money. Perhaps you might ask for the total of the eight customers. Another idea is to make up a price paid for the papers vs. the price collected to determine the profit. Including imaginary tips would be even more realistic. These are only a few of the ideas that may evolve from the information printed on the screen during the course of the program.

As usual, we encourage you to modify our programs for use in the ways that best suit your child's or student's needs. We, at Computer Island, always enjoy hearing from our readers. □

Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He owns Computer Island and lives in Staten Island, New York.

The listing: NEWSCOST

```
10 REM NEWSPAPER DELIVERY ROUTE
20 REM STEVE BLYN,COMPUTER ISLAN
D,STATEN ISLAND,NY,1988
30 CLEAR 1000:P$=STRING$(32,131)
:CLS
40 FOR T= 1 TO 8:READ A$(T):NEXT
 T
50 PRINT"HOW MANY CENTS IS A DAI
LY       NEWSPAPER THIS WEEK";:I
NPUT W:SU=W*2
60 CLS:PRINT@0,"SALES: DAILY=";W
;"  SUNDAY=";SU
70 PRINT@32,P$;
80 FOR T=1 TO 8:PRINT@128+M,A$(T
):M=M+32:NEXT T
90 IF X=256 THEN RUN ELSE R=RND(
5):PRINT@384,STRING$(126," ");
100 IF R=1 THEN B$="+ + + + + +
+":TT=6*W+SU
```

```
11Ø IF R=2 THEN B$="+ + + + + +"
:TT=6*W
12Ø IF R=3 THEN B$="+ + + + +":T
T=5*W
13Ø IF R=4 THEN B$="          +
+":TT=W+SU
14Ø IF R=5 THEN B$="+ + +
+":TT=3*W+SU
15Ø PRINT@64,"NAME        M/T/W/T
/F/S/SU=TOTAL"
16Ø PRINT@96,P$;
17Ø PRINT@384,P$;
18Ø TT=(TT/1ØØ)
19Ø PRINT@139+X,B$;
2ØØ PRINT@416,"WHAT IS THE TOTAL
? $";:LINEINPUT Q$
21Ø Q=VAL(Q$):X=X+32
22Ø IF INT(Q*(1ØØ+.Ø5))=INT(TT*(
1ØØ+.Ø5)) THEN PRINT@46Ø,"CORREC
T":SOUND 22Ø,2:GOTO 24Ø
23Ø PRINT@448,"SORRY, THE ANSWER
 IS ";:PRINT USING"$#.##";TT
24Ø PRINT@153+X-32,"";:PRINT USI
NG"$#.##";TT
25Ø PRINT@485,"PRESS ENTER TO GO
 ON";
26Ø EN$=INKEY$
27Ø IF EN$=CHR$(13) THEN 9Ø ELSE
 IF EN$="E" THEN 29Ø ELSE 26Ø
28Ø DATA JONES,SMITH,MARTIN,ROSS
,PEARL,BELL,SCOTT,GOLD
29Ø CLS:END
```

Two-Liner Contest Winner . . .

A classic pong-type game for two players, with an added obstacle in the center. Use the joysticks to keep the ball in play. For super-pro speed, use a speed-up poke.

The listing:

```
Ø READF,G,T,O,C,D,A,B,N,S(1),S(3
),O(1),O(3):PMODE1:PCLS:LINE(Ø,Ø
)-(T,O),PSET,B:COLOR2:SCREEN1:FO
RI=1TON:FORJ=ØTO3:E(J)=JOYSTK(J)
:NEXT:FORJ=1TO3STEP2:E=E(J)*2.58
+2:IFE<>O(J)THENLINE(S(J),O(J))-
(S(J),O(J)+25),PRESET:LINE(S(J),
E)-(S(J),E+25),PSET
1 O(J)=E:NEXT:PSET(A,B,H):A=A+C:
B=B+D:H=PPOINT(A,B):IFH=2THENPLA
Y"T4ØG":POKE65495,Ø:C=-C:NEXTELS
EIFH=4THENPLAY"T4ØG":D=-D:NEXTEL
SEIFA<1ØTHENSOUND1ØØ,9:RUNELSEIF
A>245THENSOUND1ØØ,9:RUNELSEPSET(
A,B,2):NEXT:DATA1,1,255,191,8,8,
128,96,9999,232,24,5,5
```

Michael Toepke
Oak Harbor, WA

(For this winning two-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape.*)

Wondering what to do with that stack of RAINBOW back issues?

The "Encyclopedia CoColoria"

By Joseph Kolar
Rainbow Contributing Editor

Throughout my adult life I've hummed to my tone-deaf self, "Once in the dear, dead days beyond recall/When on the earth the mists began to fall." This scrap of verse was all I remembered of that old song, but it stuck in my mind like glue.

Back in the dim '30s when I was struggling through the Big Apple's P.S. 82, during a rudimentary music appreciation class an old Irishman came to teach us a song he had composed. I was impressed because he was a composer; no VIPs ever came within the purview of our self-contained ethnic neighborhoods, and nobody at all ventured to bother with grimy, runny-nosed kids.

You must wonder what this has to do with THE RAINBOW!

A friend of mine who had recently bought an expensive electronic organ had gone up North for the Christmas holidays. Left to my own devices, I wondered if there were any music programs that might be of value to her and help her comprehend music theory, etc. I checked out my personal hoard of programs but found it wanting.

What do you do when you want to find a program suitable for your needs? Silly question — you consult the back issues of THE RAINBOW! Everybody knows that June is the Music Issue of THE RAINBOW, so that's where I headed.

I looked through the June '87 issue to see what I could find. I noticed some articles referring to a *Music+* program. I filed that information away in my mind, took down all my June issues from '83 onward and leafed through them.

A chord identification program in the June '84 issue caught my eye, and I duly copied the listing. Hungry for more music theory material, I reverted to the June '87 issue and copied a program that allows you to play the CoCo as a two-level organ. From the '86 issue, I pulled another goodie.

In doing all this *pro bono* work I began to generate some interest of my own in what the programs promised . . . and did.

Repairing to the June '87 issue, I read most of the articles. There was a tempting musical synthesizer program, but the listing appeared daunting; even though it promised four-voice harmony, I was chicken.

Joseph D. Platt's article intrigued me. It offered transposition refinements for *Music+*. Naturally, it meant nothing to me, but in his article he referred to Bill Ludlum's *Music+* program in the Music issues of '84 and '86. Back to the June '86 issue! Bob Ludlum's article had to do with improvements to his *Music+* program. Back further to the June '84 issue! In this article Ludlum wasted no time listing the forerunners of his program; he referred to the December '83 issue as the immediate basis of *Music+* and urged readers to refer to Larry Konecky's *CoCo Composing* program.

Do you begin to see how useful RAINBOW's back issues are to a CoCo owner? Think of all the material at hand that will never get stale. Since your interests may change or expand, back issues and the yearly index of articles in July's Anniversary Issue is a readily available pool of information.

Tracking down *Music+* led me to the June '84 issue for good. I compared it with Larry's program in the December '83 issue and found it so tempting that I keyed it in. What satisfaction! It allowed me, a tone-deaf, musical-instrumentless klutz to copy and create music. Following the rule that nothing breeds success like success, I returned to the '86 Music Issue and copied what refinements were listed. Then off to the '87 Music Issue to incorporate Joseph Platt's enhancements to the *Music+* program.

This musical odyssey was really getting me hooked. Here I was, with no musical instrument, copying a music score and creating creditable music in four-voice harmony. I couldn't get over it! As I played some of my home-grown selections, I kept looking around for the orchestra.

Without the back issues of THE RAINBOW I would not have been able to accomplish this feat.

That music synthesizer program was luring me onward. Even though I had a perfectly good four-voice program, I decided to copy the listing offered by Matthew Thompson in the June '87 issue (Page 58). This program, titled *Bells and Whistles 2*, was claimed by its author to be "one of the best-sounding all-software music synthesizers for the CoCo" in the entire world as of December, 1986. It was a toughie to copy, and then I couldn't get it to work properly.

Persistently I looked through a few issues after June's, just in case there were corrections to the program; none were offered. OK, then it must be my error. Here's another valuable use of the back issues: I usually wait a few months before I attempt to copy a listing to make sure no corrections are necessary.

I checked the program over and over again, character by character, and that gets mind-boggling; still, I had a self-made error extant that I had to find. And one evening, I did find it; in the machine language section, I had copied "36" instead of "E6." This solved the problem and *voila*, I was in business.

I love this program and the world it has opened for me. The *Bells and Whistles 2* program, by a then 16-year-old, does what it claims. The text accompanying the article has no fluff or space-fillers; every sentence means something, and if you skip a line valuable information is overlooked.

As good as the program is, I am sure in June '89 or some following year, improvements will be made and offered in THE RAINBOW. Someday these future issues will be back issues and will contain valuable material. If that article in the hypothetical future issue intrigues your curiosity and you have saved all

Florida-based Joseph Kolar is a veteran writer and programmer who specializes in introducing beginners to the powers of the Color Computer.

your back issues, you will be able to refer diligently to whatever titillates your fancy at that moment.

I have noticed that it is possible to change the Envelope/Waveform setting in the four voices by locating the cursor over the proper voice in the E/W column and using the octal number to replace the old data. For instance, if you type 24 in the desired voice, 3,0 will result. 24 is equal to octal 30, or in this case Envelope 3, Waveform 0. I found this to be very convenient when experimenting with various sounds to get the right mix for a particular song.

We CoCo users have little opportunity to use octal code, but here is one time it becomes useful. Simply rule out several columns and lines, marking the top line and the first column 0 through 7. Then fill in the boxes horizontally from 0 through 63. The information inside is equivalent to the vertical scale augmented by the horizontal scale. Thus to get Voice 1,1: Plot the vertical 1, then the horizontal 1; where they cross you find the value 9, which calls octal 11 or 1,1.

One oddity I spotted is that although at any given instance you can have no more than eight envelopes and eight waveforms, you can get some dissonant but curious effects. You would think that 63, which translates to octal 77, would be the highest value you could type in. You can, however, type in a value up to 255, even though the resultant value shown in the E/W column is kind of weird. You might get a character other than a numeral or letter as the E value. Thus, you might get :4 or B2 or 90 — obviously typing errors. Still, odd sounds are created. If only one voice has this pseudo-value, the resultant four-voice harmony might be acceptable if odd sounds are your game. This is beyond my talent, but somebody might investigate this anomaly.

At any rate this program allows you to create all kinds of sounds. Practice in copying sheet music is one great self-teaching aide. In short order, you learn to read music. Then you begin to understand time, tempo and volume mixing. Then you begin to learn what notes to discard when more than four are listed in a location. And the first thing you know, you're looking for eight-voice harmony. This leads to special software and hardware — to get mired deeper and deeper in this musical quicksand. Then you get to wondering about MIDI, a whole new ballgame. (See the MIDI tutorial by John E. Mueller in the June '87 RAINBOW, Page 36).

Bells and Whistles 2 is a great aide in teaching newcomers to music what the correct beat should be and what the song should sound like. All this flirting with music has me so enthusiastic that I have bought an organ keyboard with MIDI capabilities. Someday I will get into MIDI; but right now with the help of Matthew Thompson's super program, I have to learn to play the keyboard.

"You will find that your interests expand or change with time; programs that you ignore as useless today, you may seek eagerly at a future date."

Recently, I went to the library to rustle up some music to copy using my new tool. I came across a 1930-vintage songbook, and lo and behold! I found the song that had been rattling around in my brain all these years. It was "Love's Old Sweet Song" by J. L. Molloy. As soon as I keyed in the first few bars and ran it, a little part of my youth returned. I wonder what Mr. Molloy would say if he were around to hear me play his song just the way he wrote it, without a musical instrument? If I could go back to that classroom knowing what I know now, how could I explain to Mr. Molloy that a good 50 years later, without any musical training or inclination, I would be playing his song, in four voices, on a computer? How could I explain the CoCo without his calling the looney bin to have me carted away as a raving maniac?

Squirreling away all your copies of THE RAINBOW is one of the wisest actions you can take. If you are a relative newcomer to CoColand, you should make it a point to buy all the back issues that pertain to your personal fields of interest. Fortunately, it is no problem to determine which months you require. The annual anniversary issues contain the index for the year's cornucopia of programs. It is an expensive outlay to get all the issues, so work backwards and get the more recent ones you lack. Add them to your reference library. You will find that your interests expand or change with time; programs that you ignore as useless today, you may seek eagerly at a future date.

Let me give you an example. I was never much interested in disk programs, mainly because I didn't own a disk drive. But when I finally did get one, suddenly I wanted a good program for business files. Guess where I found a premier program? In THE RAINBOW! Beginning with the July '84 issue ("Database Delight," Page 64), a six-part database tutorial by Bill Nolan taught me the rudiments of developing a database manager program. I had doubted the possibility of finding a suitable program, and here were six tutorials lying on my shelves! Though dated in time, they are just as useful today as in the summer of '84 when I flipped past them without a second glance.

How much are all these back issues worth? To me, they are equivalent to an "Encyclopedia CoColoria." Priceless information is available upon demand.

As more and more of the back issues become unavailable, all the wisdom contained therein will be lost to you. So, the corollary is: Don't let your subscription lapse. I have talked to CoCo owners who sadly state that they have dropped THE RAINBOW — incredible to me, because as CoCo owners they put themselves at a severe disadvantage without the wealth of information stored in the magazine. They may have saved a few bucks, but they are the poorer for it.

You old CoCo veterans who have read my articles since December '82 must have heard all this before. Still, the cheapest, most valuable reference tool is in your hands at this moment. Never, never throw away any issue — you'll be sorry!

Beginning next month I'll be presenting a series of 20 articles devoted to graphics. This material was written for the granddaddy CoCo, but it is just as valid today on CoCos 2 and 3. The articles could make a good-sized book of tutorials. You may find them valuable at some time in the future — when they will be buried in back issues!

I hope you haven't minded this month's absence of listings. If you keep in mind the message I've presented instead, you will have been well served.

RAINBOW

Give us your best: Join the ranks of these courageous CoCoists in showing the Color Computer world your high score at your favorite micro-diversion. We want to put your best effort on record in THE RAINBOW's "Scoreboard" column. All entries must be received 60 days prior to publication. Entries should be printed — legibly — and must include your *full* name, address, game title, company name and, of course, your high score. Each individual is limited to three score entries per month. Send your entries to Scoreboard, c/o THE RAINBOW.

For greater convenience, your high scores may also be sent to us through the MAIL section of our Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type SEND and address to: EDITORS.

★ Current Record Holder ● Shutout

ADVANCED STAR*TRENCH (THE RAINBOW, 7/86)
4,750 ★Stephane Martel, Laval, Quebec
4,475 David Schaller, Clarkston, WA
4,500 Frankie DiGiovanni, Olney, MD
4,300 Jeffrey Warren, Waynesville, NC
3,960 Maurice MacGarvey, Dawson Creek, British Columbia

ASTRO BLAST *(Mark Data)*
48,825 ★Tony Bacon, Mt. Vernon, IN

BEE ZAPPER (THE RAINBOW, 9/87)
15,785 ★David Hartmann, Osoyoos, British Columbia
12,825 Frederick Lajoie, Nova Scotia, Canada
12,350 Tom Carpenter, Palenville, NY
12,175 Sara Mittelstaedt, Kiel, WI
11,675 Daniel Hartmann, Osoyoos, British Columbia
11,075 John Valentine, Marlborough, CT
10,850 Matthew Yarrows, Easthampton, MA
10,700 Kevin Pereira, Corsicana, TX

BOUNCING BOULDERS *(Diecom Products)*
10,930 ★Patrick Garneau, Ste-Croix, Quebec

CANYON CLIMBER *(Radio Shack)*
1,725,100 ★John Guptill, Columbia, MO
1,627,500 Matthew Fumich, Munford, TN
213,400 Sara Mittelstaedt, Kiel, WI
202,000 David Brown, New Waterford, Nova Scotia
178,200 Darren King, Yorkton, Saskatchewan

CASHMAN *(MichTron)*
9,870 ★Martin Parada, Arcadia, CA

CLOWNS & BALLOONS *(Radio Shack)*
688,960 ★Faye Keefer, Augusta, GA
217,500 Frankie DiGiovanni, Olney, MD
70,180 Charles Andrews, Delta Jct, AK
36,650 Melody Webb, Lakeport, CA
33,710 Timm Cappell, Freeland, MI

COLOR BASEBALL *(Radio Shack)*
238-0 ★●John Valentine, Marlborough, CT
119-0 ●Adam Silverstein, Chicago, IL
111-2 David Czarnecki, Northhampton, MA
96-0 ●Chad Blick, Irwin, PA
43-0 ●Jason Kopp, Downs, IL

COLOR CAR *(NOVASOFT)*
316,550 ★Alan Martin, Cornwall, Ontario
113,970 Chad Blick, Irwin, PA
110,870 Martin Parada, Arcadia, CA

COLOR POKER (THE RAINBOW, 4/83)
44,022,600 ★Earl Foster, Lynchburg, VA

DALLAS QUEST *(Radio Shack)*
81 ★Brad Wilson, Lithia Springs, GA
85 Paul Summers, Orange Park, FL
85 David and Shirley Johnson, Leicester, NC
86 Roy Grant, Toledo, OH
86 Melanie Moor, Florence, AL
87 Andrew Yarrows, Easthampton, MA
87 Douglas Bell, Duncan, OK
102 Hugh Flournoy, Jr., Spanaway, WA

DEF MOV (THE RAINBOW, 1/87)
43,806 ★Domingo Martinez, Miami, FL
35,331 David Schaller, Clarkston, WA
31,673 Douglas Bacon, Middletown, CT
30,753 Pasha Irshad, Silver Spring, MD
30,326 Frederick Lajoie, Nova Scotia, Canada

DEMON ATTACK *(Imagic)*
279,435 ★Jon Hobson, Plainfield, WI
202,260 Tom Briggs, Hillsdale, NY
89,285 Upton Thomas, Arnold, MD
72,410 Glenn Hodgson, Aberdeenshire, Scotland
67,760 Jim Davis, Sandwich, IL

DESERT PATROL *(Arcade Animation)*
234,300 ★Steven Turcotte, Matane, Quebec

DESERT RIDER *(Radio Shack)*
80,703 ★Thomas Payton, Anderson, SC
65,351 Jason Hackley, Clinton, CT
64,789 Roby Janssen, Clear Lake, IA
63,014 Rebecca Henderson, Ballston Spa, NY
62,702 William Currie, Bryans Road, MD
50,797 Patrick Devitt, Lombard, IL
47,677 Thomas Beall, Odenton, MD
33,498 Brian Anderson, Clear Lake, IA

DEVIL ASSAULT *(Tom Mix)*
1,866,100 ★Stephane Martel, Laval, Quebec
623,550 Dale Krueger, Maple Ridge, British Columbia
75,000 Blake Cadmus, Reading, PA
40,800 Benoit Landry, Drummondville, Quebec

DONPAN *(Radio Shack)*
53,100 ★Jim Davis, Sandwich, IL
52,600 Eric Olson, Wheaton, IL

DOWNLAND *(Radio Shack)*
99,980 ★Danny Wimett, Rome, NY
98,985 Karl Gulliford, Summerville, SC
97,740 Stephane Deshaies, Beloeil, Quebec
89,490 Neil Edge, Williston, FL
77,254 Tom Audas, Fremont, CA
73,346 Jean-Francois Morin, Loretteville, Quebec
70,142 Chris Goodman, Baltimore, MD
68,142 Cooper Valentin, Vavenby, British Columbia
67,721 Keith Yampanis, Jaffrey, NH
62,442 Eddie Lawrence, Pasadena, Newfoundland
55,300 Patrico Gonzalez, Buenos Aires, Argentina
49,500 Danny Perkins, Clifton Forge, VA
49,441 Kevin Pater, Port Alberni, British Columbia
49,254 David Brown, New Waterford, Nova Scotia
43,502 Mike Ells, Charlotte, MI
43,369 Jason Kloostra, Jenison, MI
41,896 Antonio Hidalgo, San Jose, Costa Rica
40,360 Jesse Binns, Phoenix, AZ
35,611 Adam Broughton, Morris, PA
35,169 Daniel Norris, New Albany, IN
23,649 Jim Herr, Newton, WI
22,366 Tommy Herr, Newton, WI
19,579 Steven Turcotte, Matane, Quebec

DRAGON FIRE *(Radio Shack)*
160,835 ★Eric Olson, Wheaton, IL
146,325 Stephane Martel, Laval, Quebec
11,726 Marcos Rodriguez, New York, NY
9,861 Michael Adams, Columbia, SC
9,200 Jesse Cogdell, Wilmington, DE

ENCHANTER *(Infocom)*
400/223 ★Konnie Grant, Toledo, OH

ESCAPE 2012 *(Computerware)*
202 ★Roy Grant, Toledo, OH
199 Milan Parekh, Anaheim, CA

FIRESTORM (THE RAINBOW, 1/86)
22,505 ★Chad Presley, Luseland, Saskatchewan
11,250 Stephane Martel, Laval, Quebec
5,680 Kathy Rumpel, Arcadia, WI
3,760 Rick Beevers, Bloomfield, MN
3,505 Blake Cadmus, Reading, PA

GALACTIC ATTACK *(Radio Shack)*
31,100 ★Upton Thomas, Arnold, MD
29,030 David Czarnecki, Northhampton, MA
26,370 Jeff Remick, Warren, MI
22,250 Dave Staub, Moundsville, WV
11,830 Sheldon Penney, Green Bay, Newfoundland

GALAGON *(Spectral Associates)*
751,020 ★Sofia Giorgi, Brasilia, Brazil
357,890 Jason Clough, Houston, TX
328,820 Bernard Burke, Lee's Summit, MO
249,960 Matthew Fumich, Munford, TN
169,410 Danny Dunne, Pittsfield, NH

GANTELET *(Diecom Products)*
45,235,820 ★Ken Hubbard, Madison, WI
23,643,720 Geran Stalker, Rivordalo, GA
20,921,490 Randall Edwards, Dunlap, KS
10,222,940 Clinton Morell, Sacramento, CA
7,493,340 Stirling Dell, Dundalk, Ontario

GHANA BWANA *(Radio Shack)*
2,350,750 ★Michael Heitz, Chicago, IL
702,520 Joseph Delaney, Augusta, GA
105,820 David Reash, Hadley, PA

GIN CHAMPION *(Radio Shack)*
1,120-0 ★●Kim Johns, Port Cog., British Columbia

GROBOT *(Children's Computer Workshop)*
8,090 ★Curt Lebel, Louisville, KY

HITCHHIKER'S GUIDE TO THE GALAXY *(Infocom)*
400/359 ★Roy Grant, Toledo, OH
400/422 Jeff Holtham, Waterloo, Ontario
400/510 Brad Wilson, Lithia Springs, GA

INTERBANK INCIDENT *(Radio Shack)*
4,861 ★Shara and Chris Euton, Lilburn, GA

IRON FOREST *(Diecom Products)*
3,173,200 ★Charles Boyd, Amarillo, TX
2,676,300 Janet Boyd, Amarillo, TX
1,141,650 Craig Pennell, Amarillo, TX
1,013,100 William Weller, Kailua, HI
595,700 Daniel Wibier, Santa Rosa, CA

JOKER POKER (THE RAINBOW, 3/87)
43,616,750 ★Carole Rueckert, Mansfield, OH
8,179,710 Brenda Kim, Athens, OH
3,796,898 Curtis Trammel, Murphysboro, IL
2,793,285 Blain Jamieson, Kingston, Ontario
205,239 Paul Dykes, Baton Rouge, LA
18,889 Frankie DiGiovanni, Olney, MD

JUNIOR'S REVENGE *(Computerware)*
2,503,000 ★Stephane Martel, Laval, Quebec
257,600 Keith Cohen, Rocky Mount, NC

KARATE *(Diecom Products)*
31,000 ★Wayne Hufford, Kincardine, Ontario
21,800 Daniel Hartmann, Osoyoos, British Columbia
11,600 Jonathon Ross, Pocomoke City, MD
6,300 David Darling, Longlac, Ontario
5,600 Steven Turcotte, Matane, Quebec

KORONIS RIFT *(Epyx)*
186,710 ★Tony Harbin, Cullman, AL
184,180 Russell Johnson, Sarnia, Ontario
184,120 John Farrar, Lebanon, TN
174,810 Donald Cathcart, Halifax, Nova Scotia
133,990 Paul Blessing, Spring, TX

KUNG-FU DUDE *(Sundog Systems)*
32,000 ★Tony Geitgey, University Park, PA

SCOREBOARD

12,150 Cody Deegan, Fallon, NV

THE LAIR *(Freebooter Software)*
112,940 ★James Walton, Pittsburgh, PA

LUNAR RESCUE (THE RAINBOW 8/87)
260,427 ★Tom Beeker, Gracey, KY
259,493 Cody Deegan, Fallon, NV
255,625 John Valentine, Marlborough, CT
246,668 Phillip Holsten, Modesto, CA
175,771 Jim Davis, Sandwich, IL

LUNAR-ROVER PATROL *(Spectral Associates)*
37,890 ★Dave Staub, Moundsville, WV
30,000 Vincent Tremblay, Matane, Quebec

MAGIC OF ZANTH *(Computerware)*
31 ★Paul Summers, Orange Park, FL
44 Matthew Smith, Courtenay, British Columbia
45 Michael Green, Ware, MA
47 Robert Williams, Yellowknife, Northwest Territory

MEGA-BUG *(Radio Shack)*
9,016 ★Heather Richwalski, Medford, WI
8,199 Eric Mellon, Newark, DE
6,404 David Hartmann, Osoyoos, British Columbia
5,960 Mary Jensen, El Cajon, CA
5,528 Douglas Bacon, Middletown, CT

MEMOCARDS (THE RAINBOW, 8/87)
1,418 ★Edward Kavanaugh, North Easton, MA
1,414 Sara Mittelstaedt, Kiel, WI

MISSION: F-16 ASSAULT *(Diecom Products)*
468,750 ★Karen Jessen, Cleveland, OH
355,570 Stirling Dell, Dundalk, Ontario
318,160 Jeremy Pruski, Sandwich, IL
144,510 Donald Cathcart, Halifax, Nova Scotia
137,920 Mike Grant, Fresno, CA

MUNCHKIN BLASTER (THE RAINBOW, 8/87)
11,950 ★Jim Davis, Sandwich, IL
10,420 Gabe Emerson, Baraboo, WI
9,760 Tom Beeker, Gracey, KY
9,270 Edward Kavanaugh, North Easton, MA
9,080 John Weaver, Amsterdam, NY

ONE-ON-ONE *(Radio Shack)*
1,302-0 ★●Thomas Payton, Anderson, SC
1,276-0 ●Jonathan Dorris, Indianapolis, IN
1,260-0 ●Brandon Reece, Chickamauga, GA
1,242-0 ●William Currie, Bryans Road, MD
1,210-0 ●Gregg Thompson, Chesterfield, VA

OUTHOUSE *(MichTron)*
38,640 ★Dave Staub, Moundsville, WV

PAC PANIC *(Cougar)*
34,950 ★Heather Hamblen, Bar Harbor, ME

PINBALL *(Radio Shack)*
1,139,450 ★Benoit Landry, Drummondville, Quebec
399,350 Troy Stoll, Washington, IN
389,463 Thomas Payton, Anderson, SC
213,300 Patrick Martel, Laval, Quebec
142,400 Thomas Payton, Anderson, SC

PITFALL II *(Activision)*
197,048 ★Keith Catrett, Montgomery, AL
159,400 David Cornette, Green Bay, WI
104,479 David Stewart, Kent, OH

PITSTOP II *(Epyx)*
54 ★Rusty Breitbach, Rickardsville, IA
54 ★Jeff Coburn, Easton, PA
54 ★Walter Hearne, Pensacola, FL
54 ★Sean Noonan, Green Bay, WI
54 ★Thomas Payton, Anderson, SC
54 ★Jeff Szczerba, Sturtevant, WI
54 ★Brad Wilson, Lithia Springs, GA
51 Christian Grenier, Valleyfield, Quebec
49 Randy Venable, Coal City, WV
14 Eric Mellon, Newark, DE
9 Laundre Clemon, Sacramento, CA

POOYAN *(Datasoft)*
236,650 ★Jeff Mrochuk, Edmonton, Alberta
111,600 William Cathey, Kings Mtn., NC

POPCORN *(Radio Shack)*
105,560 ★Heather Condit, Grafton, ND
26,889 Claude Jalbert, Matane, Quebec
20,800 Kristopher Santos, Laurel, MD

PYRAMID *(Radio Shack)*
220 ★Jason Ebbeling, Berkshire, MA

PYRAMID 2000 *(Radio Shack)*
220 ★Darren King, Yorkton, Saskatchewan
125 Chris VanOosbree, Emmetsburg, IA
100 Peter Antonacopoulos, Toa Baja, Puerto Rico

PYRAMIX *(ColorVenture)*
67,850 ★Richard Winkelbauer, Bronx, NY
56,970 Andy Freeman, Turtle Lake, WI
37,500 Matthew Smith, Courtenay, British Columbia
26,900 Todd Kopke, Glendale Heights, IL
20,120 Lori Curran, La Porte City, IA

QUIX *(Tom Mix)*
8,407,772 ★John Haldane, Tempe, AZ
1,404,000 Curtis Goodson, Sao Paulo, Brazil
1,201,383 Milan Parekh, Anaheim, CA
1,003,104 Elisa Goodson, Sao Paulo, Brazil
326,192 Martin Parada, Arcadia, CA

RESCUE ON FRACTALUS *(Epyx)*
1,000,948 ★Steven Ujvary, Calgary, Alberta
323,167 Kenneth Hill, Severna Park, MD
292,633 David Richards, Huntington, WV
288,084 Donald Cathcart, Halifax, Nova Scotia
270,000 Russell Johnson, Sarnia, Ontario

RETURN OF THE JET-I *(ThunderVision)*
336,563 ★Jesse Collicott, Inman, KS

RETURN OF JUNIOR'S REVENGE *(Colorware)*
1,792,800 ★Chad Presley, Luseland, Saskatchewan

ROGUE *(Epyx)*
63,934 ★Marshall Weisenburger, Quincy, IL
43,222 Hans Lutenegger, Madison, IA
27,542 Melanie Lapoint, Fitchburg, MA
21,682 Paul Blessing, Spring, TX
17,851 Yvan Langlois, Laval, Quebec
15,445 Frankie DiGiovanni, Olney, MD

SANDS OF EGYPT *(Radio Shack)*
67 ★Tristan Terkuc, Richmond, Ontario
82 Edward Rocha, Cobleskill, NY
85 Paul Summers, Orange Park, FL
86 Roy Grant, Toledo, OH
87 Neil Haupt, Elyria, OH

SAUCER DEFENSE *(THE RAINBOW, 4/87)*
40,000 ★David Hartmann, Osoyoos, British Columbia
4,000 Frankie DiGiovanni, Olney, MD

SHAMUS *(Radio Shack)*
25,450 ★John Garness, Newell, SD

SHOOTING GALLERY *(Radio Shack)*
27,270 ★Jocelyn Hellyer, Montgomery, IL
25,510 Donald Knudson, Minot, ND
20,480 Kevin Pereira, Corsicana, TX

SHOOT'N RANGE (THE RAINBOW, 8/87)
55,623 ★Paul Robbins, Picayune, MS
14,702 Richard Winkelbauer, Bronx, NY
13,794 Phillip Holsten, Modesto, CA
5,433 Benoit Landry, Drummondville, Quebec

SLAY THE NERIUS *(Radio Shack)*
73,091 ★Jeff Remick, Warren, MI

SPACE ASSAULT *(Radio Shack)*
13,110 ★Jeff Remick, Warren, MI
7,280 Jason Kopp, Downs, IL
6,200 John Weaver, Amsterdam, NY

SPEEDSTER (THE RAINBOW 8/87)
103,140 ★Richard Winkelbauer, Bronx, NY
88,090 Jason Landreth, Texico, IL
44,540 Kevin Pereira, Corsicana, TX
37,970 Frederick Lajoie, Nova Scotia, Canada
35,040 John Valentine, Marlborough, CT
32,110 Lisa Williamson, Watauga, TX

SPIDERCIDE *(Radio Shack)*
27,730 ★Mike LeBrun, Cornwall, Ontario
1,840 Dave Staub, Moundsville, WV

SPRINGSTER *(Radio Shack)*
303,520 ★Mavis Hartmann, Osoyoos, British Columbia

SUPER ROOTER (THE RAINBOW, 5/86)
19,090 ★Frederick Lajoie, Nova Scotia, Canada
15,180 Richard Donnell, Penns Grove, NJ
3,910 Daniel Bradford, Birmingham, AL

TEMPLE OF ROM *(Radio Shack)*
604,000 ★Troy Graham, Arnold, MD
507,700 Adam Broughton, Morris, PA
303,600 Tim Hennon, Highland, IN
138,400 Gary Budzak, Westerville, OH
125,200 Michelle Murray, Salem, IN

THEXDER *(Sierra On-Line)*
1,411,700 ★Steve Hallin, Biloxi, MS
1,314,100 Frankie DiGiovanni, Olney, MD
312,300 Timothy DeJong, Rock Valley, IA
195,000 Emmett Keyser, Napa, CA

TREASURE QUEST (THE RAINBOW, 11/86)
66,760 ★Clara Smith, Courtenay, British Columbia
29,340 Matthew Smith, Courtenay, British Columbia

TREKBOER *(Mark Data)*
123 ★Roy Grant, Toledo, OH
132 Matthew Fumich, Munford, TN

TRIG ATTACK *(Sugar Software)*
196,000 ★Cassaundra Stewart, Sacramento, CA

TUT'S TOMB *(Mark Data)*
118,720 ★Reina Roy, Carleton, Quebec
74,780 Mack Haynes, Nice, CA
72,000 Chad Presley, Luseland, Saskatchewan
60,020 Don Siler, Muncie, IN
45,000 Blake Cadmus, Reading, PA

VARLOC *(Radio Shack)*
2,032 ★Tony Harbin, Cullman, AL
2,032 ★Edward Rocha, Cobleskill, NY
2,011 Antonio Souza III, North Dartmouth, MA
2,008 Philip Puffinburger, Winchester, VA
1,995 Denise Rowan, Minneapolis, MN
1,991 Ryan Grady, Newbury Park, CA
1,988 Randall Edwards, Dunlap, KS

VICIOUS VIC (THE RAINBOW, 7/86)
18,813 ★Talib Khan, Bronx, NY
11,902 Martha James, Swarthmore, PA
10,489 Karl Gulliford, Summerville, SC
6,294 Pat O'Neill, Nepean, Ontario
4,643 Martha James, Swarthmore, PA

THE VORTEX FACTOR *(Mark Data)*
100/276 ★Tommy Crouser, Dunbar, WV
100/483 Rick & Brenda Stump, Laureldale, PA
210 Paul Maxwell, Vancouver, British Columbia

WARP FACTOR X *(Prickly-Pear)*
10,577,051 ★Doug Lute, Clymer, PA

WILDWEST *(Tom Mix)*
35 ★Paul Summers, Orange Park, FL

WISHBRINGER *(Infocom)*
400/201 ★Brad Wilson, Lithia Springs, GA

WIZARD'S DEN *(Tom Mix)*
195,050 ★Mark Touchette, Preston, CT

WRESTLE MANIAC *(Diecom)*
956,971 ★Marc Reiter, Cincinnati, OH
546,315 Louis Bouchard, Gatineau, Quebec
45,483 Tony Bacon, Mt. Vernon, IN
42,105 David Brown, New Waterford, Nova Scotia
39,086 Billy Helmick, Independence, KY

ZAKSUND *(Elite Software)*
357,550 ★Martin Parada, Arcadia, CA
268,350 Tony Bacon, Mt. Vernon, IN
44,900 Michael Adams, Columbia, SC
39,950 Walter Hearne, Pensacola, FL

ZAXXON *(Datasoft)*
2,061,000 ★Byron Alford, Raytown, MO
1,950,000 Blake Cadmus, Reading, PA
1,300,500 Dan Brown, Pittsford, NY
1,100,600 Andrew Urquhart, Metairie, LA
376,600 Matthew Yarrows, Easthampton, MA
57,895 Vincent Tremblay, Matane, Quebec

ZEUS *(Aardvark)*
4,500 ★Benoit St-Jean, Gatineau, Quebec
3,380 Martin Kertz, Forrest City, AR

ZORK I *(Infocom)*
350/328 ★Konnie Grant, Toledo, OH
350/587 Matthew Yarrows, Easthampton, MA

ZONX (THE RAINBOW, 10/85)
12,000 ★Adam Broughton, Morris, PA

— Jody Doyle

SCOREBOARD POINTERS

In conjunction with THE RAINBOW's Scoreboard, we offer this column of pointers for our game-playing readers' benefit. If you have some interesting hints, tips or responses to questions, or want help yourself, we encourage you to write to the Scoreboard, c/o THE RAINBOW.

In response to questions from:

• Duncan Cameron: To get to the blue doors in *Bedlam*, you must be in your cell. From there, type OPEN GREEN DOOR. Then go south, east, open the green door, go north and get Napoleon to follow you. Go south, ask Napoleon to open the red door and go south again. You will find the blue doors as you go through the north-south hallway.

To get the red key, go to the cabinet where the red key is located and type GO WEST. Take the window hook and go east. Take the red key with the window hook. You do not necessarily need the red key, just get Napoleon to follow you. When you need a door opened, whether it is green, red or blue, just type NAPOLEON OPEN RED DOOR (or whatever color door you need opened).

Jon Hobson
Plainfield, WI

• James Green: It is impossible to retrieve the wizard's image scroll in *Dungeons of Daggorath*. The third ring is in the level after you kill the wizard's image; it comes from a goldrog and is the joule ring. Incant it to the energy ring; you need this to help kill the evil wizard. The elvish sword also comes from a goldrog; you need this for the wizard as well.

• Robert Sherman: In order to get the flashlight in the Chugalug trading post in *Dallas Quest*, you must pull the curtain, then give the monkey the tobacco. Drop everything except the flashlight, and type CLIMB LADDER. Before going down into the pit, turn the light on. In the pit go east, enter the post, get the sack, put everything in it and climb down. Get the light and go west.

Andy Yarrows
Easthampton, MA

• Jason Ebbeling: To row the boat in *Dallas Quest*, you have to type ROW BOAT; you must have the small shovel.

After giving the eggs to the natives and giving the mirror to the monkey, what do you do? How do you get to the cave?

Sagie Kraidman
Brooklyn, NY

Scoreboard:

I am stuck on Level 9 in *Bouncing Boulders* and can only get about five out of 25 gems. Can anyone give me some advice to get all of them so I can get to Level 10?

Troy Grice
Sinton, TX

Scoreboard:

I have gotten as far as the iron castle in *Caladuril Flame of Light*, but I can't get across the blue and red game board. I have the map the parrot gave me, but when I step on the last square of the "safe route" I get zapped.

In *In Search of the Star Lord*, I can't find the control circuit for the laser barricades.

Floyd Resler
Cincinnati, OH

Scoreboard:

When I get to the island in *Calixto Island*, I cannot get past the natives.

Clifford Lingle
Overland Park, KS

Scoreboard:

What do you do with the eggs in *Dallas Quest* once you're in the cave?

Danielle Ramsey
Centralia, MO

Scoreboard:

In *Dallas Quest* I cannot get out of the tree after I jump out of the plane.

I die before I can get to the pool in *Sands of Egypt*. Please help.

Andrea Jenkins
Gander, Newfoundland

Scoreboard:

In *Finding Enrakian Treasure* I need to know what to do in the colored rooms. Where is the bullet? How do I get the rose?

How do I get past the rats and through the locked door by the diner in *Sam Diamond P.I.*?

In *SYZYGY* what do I do with the sword, knife, string, blanket and spacesuit? How do I work the transporter console? Where do I find this fuzzy creature I've heard about? What use is the elevator?

Angela Aldred
East Peoria, IL

Scoreboard:

How can I open the lock mechanism in *Graphic Pyramid*? How can I go back to the archeologist hut with the treasures?

J.P. Brassard
Jonquiere, Quebec

Scoreboard:

In *Lansford Mansion* how do you prevent the guard from throwing you out several moves after you yell fire?

How do you prevent from getting killed by sand when you dig in *Infidel*?

Ed Gilliland
Southfiled, MI

Scoreboard:

I need help getting past the cliff and other places in *Martian Crypt*. Any hints, tips and vocabulary would be appreciated.

Jon Miller
St-Lambert, Quebec

Scoreboard:

How do I get to the central computer in *Thexder* after I have completed the 15 levels?

Glenn Laws
Toledo, OH

Scoreboard:

After I deliver the letter to the magic shop in *Wishbringer*, I come down the mountain, but I cannot get past the troll at the covered bridge. He wants a gold coin, but I don't have any. How do I get past him?

In *Dallas Quest* when you leave the trading post, how do you get to the cannibals?

H. James Herchek
Cleveland Heights, OH

To respond to other readers' inquiries and requests for assistance, reply to "Scoreboard Pointers," c/o THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We will share your reply with all "Scoreboard" readers in an upcoming issue.

For greater convenience, "Scoreboard Pointers" and requests for assistance may also be sent to us through the MAIL section of our Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type SEND and address to: EDITORS. Be sure to include your complete name and address.

Keep track of the body count in role-playing games

The "Hit" List

By Andrew Dater

Since 1981, a new role-playing game has swept across the nation. The game is Killer. Unlike those in other role-playing games, the players are the *actual* characters; they go around shooting other players with squirt or dart guns, blowing them up with water balloon hand grenades, and blasting them with flashlight lasers.

Most games involve some sort of scenario. For instance, in the Circle of Death you are given a victim to "kill." If you "off" your victim, you go after your victim's victim, and so on. But watch out, the same thing is happening behind you, and if you're not careful, it could happen to you!

Or you may be playing the Mafia scenario. This one pits rival gangs against each other, with one team designated as the FBI. Not only do you try to "kill" your opponents, but you try to amass enormous wealth. But be careful because, just as in real life, the gangs have spies, and you may not live to see tomorrow if you're found out!

The person who organizes the game must keep track of large amounts of data. This includes who was killed, how many points earned, personal information, and so on. What could be better for keeping track of all this information than good ol' CoCo?

The Assassination Game Utility is very easy to use. It runs from a main menu of 10 choices. All you have to do is press 0 through 9 and you are taken to the appropriate subroutine.

Throughout the program, if you want to return to the menu, press Q. On options 2, 3 and 4, when it asks for the player's name, press ENTER. It will ask you for a code name if you can remember it more easily.

Options 1 through 3 let you add, edit or remove players. When players are created, they are automatically made alive and active. Both of these may be changed using Option 4. The program allows for only 40 players, so if you near the limit, you may delete players or change the DIM statement if memory allows.

Option 4 allows you to change the amount of kill, bonus and penalty points a player has and change the alive and active statuses. If a player is in the round you are currently running, he must be active and either alive or dead. If a player you have on your list is not playing the current round, he must be made inactive. After you make the necessary changes, press Q to return to the menu and press the space bar to change another player.

Options 5 and 6 take care of points for staying alive each day and points for not making a kill after a certain number of days. Option 7 separates the players by their being either "alive" or "dead," sorting them by points from highest to lowest, and then prints out the list to the printer.

Option 8 sorts the players alphabetically and then returns to the menu (this is so the players will be in alphabetical order when you do a list). Option 9 lists the players and their code names to the

---

Andy Dater works for Tandy as a training and support specialist in the Business Products division. He is involved in many role-playing games, and playing Killer *was a natural progression into real-life role-playing. Andy's username on Delphi is* DATER.

screen. If you print the list to the printer, the alive and active statuses will also be printed.

Before you run the program for the first time or after you have killed the data file, you must run the following listing, which creates a "dummy" data file:

```
10 OPEN"O",1,"TAG"
20 PRINT#1,0
30 CLOSE
```

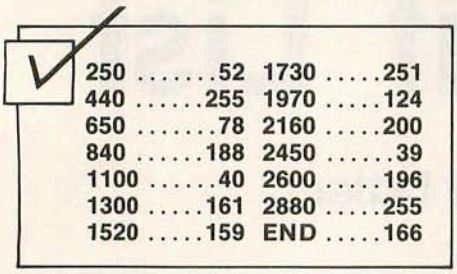
If you find that the data categories don't suit your needs, you can change the category titles in Line 3040. You should not, however, change first name, last name or code name.

I have used the speed-up poke in the two sort routines, so for those of you whose computers can't handle it, delete lines 960 and 2130.

This program helps me a lot when I run rounds of The Assassination Game and have to keep track of points. I hope it will help you if you plan on running a round.

If you want more information about the game, go to your local hobby or game store and look for the book called *Killer*, by Steve Jackson. It is a manual on the game and it explains it very well.

(Questions about this program may be addressed to the author at 23751 Albers, Woodland Hills, CA 91367. Please enclose an SASE for a written reply.) □



250	52	1730	251
440	255	1970	124
650	78	2160	200
840	188	2450	39
1100	40	2600	196
1300	161	2880	255
1520	159	END	166

The listing: KILLER

```
1Ø 'THE ASSASSINATION GAME
2Ø '(C) 1986 ANDY DATER
3Ø GOTO3Ø5Ø
4Ø FILES1:CLEAR12ØØØ:DIMD$(4Ø,18
),T$(4Ø,17),SM$(17),P(4)
5Ø CLS:PRINT"LOADING DATA..."
6Ø OPEN"I",1,"TAG/DAT"
7Ø INPUT#1,R
8Ø IFR=ØTHEN13Ø
9Ø FORX=1TOR
1ØØ FORY=1TO17
11Ø LINEINPUT#1,D$(X,Y)
12Ø NEXTY,X
13Ø CLOSE
14Ø FORX=1TO11
15Ø READD$(Ø,X)
16Ø NEXTX
17Ø CLS:P$="THE ASSASSINATION GA
ME":GOSUB28ØØ
18Ø PRINT
19Ø PRINTTAB(5)"1 - ADD PLAYER"
2ØØ PRINTTAB(5)"2 - EDIT PLAYER"
21Ø PRINTTAB(5)"3 - DELETE PLAYE
R"
22Ø PRINTTAB(5)"4 - CHANGE POINT
S"
23Ø PRINTTAB(5)"5 - DAILY BONUSE
S"
24Ø PRINTTAB(5)"6 - NON-KILL PEN
ALTIES"
25Ø PRINTTAB(5)"7 - PRINT POINTS
 LIST"
26Ø PRINTTAB(5)"8 - SORT LIST"
27Ø PRINTTAB(5)"9 - LIST PLAYERS
"
28Ø PRINTTAB(5)"Ø - QUIT"
29Ø Q$=INKEY$:IFQ$<"Ø"ORQ$>"9"TH
EN29Ø
3ØØ A$="":B$="":N=Ø
31Ø ONVAL(Q$)+1GOSUB269Ø,34Ø,5ØØ
,72Ø,114Ø,163Ø,189Ø,211Ø,95Ø,255
Ø
32Ø I$="":GOTO17Ø
33Ø 'ADD PLAYER
34Ø CLS:P$="ADD PLAYER":GOSUB28Ø
Ø
35Ø GOSUB285Ø
36Ø R=R+1
37Ø FORX=1TO11
38Ø L=76+32*X
39Ø GOSUB297Ø
4ØØ IF(I$="Q"ORI$="")ANDX=1THENR
=R-1:RETURN
41Ø D$(R,X)=I$
42Ø NEXTX
43Ø FORX=12TO15:D$(R,X)=STR$(Ø):
NEXTX:D$(R,16)="ALIVE":D$(R,17)=
"Y"
44Ø PRINT@48Ø,"ARE ENTRIES CORRE
CT? (Y/N/Q)";
45Ø A$=INKEY$:IFA$="N"THENN=R:GO
TO63ØELSEIFA$="Q"THENRETURNELSEI
FA$<>"Y"THEN45Ø
46Ø PRINT@48Ø,"ADD ANOTHER? (Y/N
)       ";
47Ø A$=INKEY$:IFA$="Y"THENPRINT@
48Ø,STRING$(31," ");:GOTO35ØELSE
IFA$<>"N"THEN47Ø
48Ø RETURN
49Ø 'EDIT PLAYER
5ØØ CLS:P$="EDIT PLAYER":GOSUB28
ØØ
51Ø PRINT@96,"";:LINEINPUT"NAME:
 ";A$
52Ø IFA$="Q"THENRETURN
53Ø IFA$<>""THEN56Ø
54Ø LINEINPUT"CODENAME: ";A$
55Ø IFA$=""THENRETURNELSE59Ø
56Ø Q=INSTR(A$," ")
57Ø IFQ=ØTHENA$="":GOTO5ØØ
58Ø B$=RIGHT$(A$,LEN(A$)-Q):A$=L
EFT$(A$,Q-1)
59Ø FORN=1TOR
6ØØ IFA$=D$(N,1)ANDB$=D$(N,2)THE
N63ØELSEIFA$=D$(N,3)THEN63ØELSEN
EXTN
61Ø PRINT"NOT FOUND."
```

```
62Ø EXEC44539:GOTO5ØØ
63Ø AN=1:AD=1:GOSUB285Ø
64Ø A$="":PRINT@448,STRING$(31,"
 ");:PRINT@448,"";:LINEINPUT"CHA
NGE WHICH FIELD: ";A$
65Ø IFA$="Q"THENRETURNELSEA=VAL(
A$)
66Ø IFA<1ORA>11ORA<>INT(A)THEN64
Ø
67Ø L=112+32*(A-1)
68Ø GOSUB297Ø
69Ø IFI$=""THENPRINT@L,D$(N,A);E
LSED$(N,A)=I$
7ØØ GOTO64Ø
71Ø 'DELETE PLAYER
72Ø CLS:P$="DELETE PLAYER":GOSUB
28ØØ
73Ø PRINT@96,"";:LINEINPUT"NAME:
 ";A$
74Ø IFA$="Q"THENRETURN
75Ø IFA$<>""THEN78Ø
76Ø LINEINPUT"CODENAME: ";A$
77Ø IFA$=""THENRETURNELSE81Ø
78Ø Q=INSTR(A$," ")
79Ø IFQ=ØTHENA$="":GOTO72Ø
8ØØ B$=RIGHT$(A$,LEN(A$)-Q):A$=L
EFT$(A$,Q-1)
81Ø FORN=1TOR
82Ø IFA$=D$(N,1)ANDB$=D$(N,2)ORA
$=D$(N,3)THEN85ØELSENEXTN
83Ø PRINT"NOT FOUND."
84Ø EXEC44539:GOTO72Ø
85Ø AD=1:GOSUB285Ø
86Ø PRINT@48Ø,"ARE YOU SURE? (Y/
N)";
87Ø A$=INKEY$:IFA$="N"THENRETURN
ELSEIFA$<>"Y"THEN87Ø
88Ø FORX=N+1TOR
89Ø FORY=1TO17
9ØØ D$(X-1,Y)=D$(X,Y)
91Ø NEXTY,X
92Ø R=R-1
93Ø RETURN
94Ø 'SORT LIST
95Ø CLS:PRINT"SORTING..."
96Ø POKE65495,Ø
97Ø FORP=1TOR
98Ø PRINT@32,P;
99Ø SM$(1)=CHR$(255):SM$(2)=CHR$
(255)
1ØØØ FORA=1TOR
1Ø1Ø PRINT@4Ø,A;
1Ø2Ø IFD$(A,2)+D$(A,1)<SM$(2)+SM
$(1)THENFORX=1TO17:SM$(X)=D$(A,X
):NEXTX:SB=A
1Ø3Ø NEXTA
1Ø4Ø FORX=1TO17:T$(P,X)=SM$(X):N
EXTX
1Ø5Ø D$(SB,1)=CHR$(255):D$(SB,2)
=CHR$(255)
1Ø6Ø NEXTP
1Ø7Ø FORX=1TOR
1Ø8Ø FORY=1TO17
1Ø9Ø D$(X,Y)=T$(X,Y)
11ØØ NEXTY,X
111Ø POKE65494,Ø
112Ø RETURN
113Ø 'CHANGE POINTS
114Ø CLS:P$="CHANGE POINTS":GOSU
B28ØØ
115Ø PRINT@96,"";:LINEINPUT"NAME
: ";A$
116Ø IFA$="Q"THENRETURN
117Ø IFA$<>""THEN12ØØ
118Ø LINEINPUT"CODENAME: ";A$
119Ø IFA$=""THENRETURNELSE123Ø
12ØØ Q=INSTR(A$," ")
121Ø IFQ=ØTHENA$="":GOTO114Ø
122Ø B$=RIGHT$(A$,LEN(A$)-Q):A$=
LEFT$(A$,Q-1)
123Ø FORN=1TOR
124Ø IFA$=D$(N,1)ANDB$=D$(N,2)TH
EN127ØELSEIFA$=D$(N,3)THEN127ØEL
SENEXTN
125Ø PRINT"NOT FOUND."
126Ø EXEC44539:GOTO114Ø
127Ø PRINT@96,"NAME: "D$(N,1)" "
D$(N,2)
128Ø PRINT"CODENAME: "D$(N,3)
129Ø PRINT
13ØØ FORX=1TO4:P(X)=VAL(D$(N,X+1
1)):NEXTX
131Ø P(4)=P(1)+P(2)+P(3)
132Ø PRINT@192,"1 - KILLS:    "P
(1)
133Ø PRINT"2 - BONUSES:  "P(2)
134Ø PRINT"3 - PENALTIES:"P(3)
135Ø PRINT"4 - TOTAL:    "P(4)
136Ø PRINT"5 - STATUS:    "D$(N,
```

One-Liner Contest Winner . . .

If you want to traumatize the authority figure in your life, run this program and take potshots at the TV. This one-liner generates a changing pattern of bull's-eyes. If you can find your old rubber-tipped dart guns, you're set for target practice.

The listing:

```
1 PMODE4,1:SCREEN1,1:PCLS:POKE17
8,3:CIRCLE(126,96),2Ø:CIRCLE(126
,96),4Ø:CIRCLE(126,96),6Ø:CIRCLE
(126,96),8Ø:CIRCLE(126,96),92:PA
INT(126,96),,1:POKE178,1:PAINT(4
4,96),,1:POKE178,2:PAINT(48,96),
,1:POKE178,31:PAINT(72,96),,1:FO
RW=1TO5ØØØ:NEXTW:GOTO1
```

Merwyn Bly
Vienna, VA

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape*.)

```
16)
137Ø PRINT"6 - ACTIVE:    "D$(N,
17)
138Ø PRINT@384,"CHANGE WHICH? (1
-6)            "
139Ø A$=INKEY$:IF(A$<"1"ORA$>"6"
)ANDA$<>"Q"ANDA$<>" "THEN139ØELS
EA=VAL(A$)
14ØØ IFA$="Q"ORA$=" "THEN157Ø
141Ø PRINT@384,STRING$(31," ");:
PRINT@384,"";
142Ø IFA=5THEN147Ø
143Ø IFA=6THEN153Ø
144Ø C=Ø:INPUT"CHANGE";C
145Ø P(A)=P(A)+C
146Ø GOTO131Ø
147Ø PRINT"IS PLAYER <A>LIVE OR
<D>EAD"
148Ø I$=INKEY$:IFI$=""THEN148Ø
149Ø IFI$="A"THEND$(N,16)="ALIVE
":GOTO132Ø
15ØØ IFI$="D"THEND$(N,16)="DEAD"
:GOTO132Ø
151Ø IFI$=CHR$(13)THENGOTO132Ø
152Ø GOTO148Ø
153Ø PRINT"IS PLAYER ACTIVE? (Y/
N)"
154Ø I$=INKEY$:IFI$<>"Y"ANDI$<>"
N"THEN154Ø
155Ø D$(N,17)=I$
156Ø GOTO132Ø
157Ø FORX=1TO4
158Ø D$(N,X+11)=STR$(P(X))
159Ø NEXTX
16ØØ IFA$=" "THEN114Ø
161Ø RETURN
162Ø 'DAILY BONUSES
163Ø CLS:P$="ADD DAILY POINTS":G
OSUB28ØØ
164Ø PRINT
165Ø INPUT"HOW MUCH TO ADD TO EA
CH ALIVE   PLAYER";A
166Ø IFA=ØTHENRETURNELSECLS
167Ø FORX=1TOR
168Ø IFD$(X,16)="DEAD"ORD$(X,17)
="N"THEN172Ø
169Ø Q=Q+1
17ØØ PRINTD$(X,1)" "D$(X,2):PRIN
TTAB(1Ø)D$(X,3)
171Ø IFQ/7=INT(Q/7)THENPRINT@489
,"PRESS <ENTER>";:EXEC44539:CLS
172Ø NEXTX
173Ø PRINT:PRINT"IS LIST CORRECT
? (Y/N)"
174Ø I$=INKEY$:IFI$=""THEN174Ø
175Ø IFI$="Y"THEN178Ø
176Ø IFI$="N"THENPRINT"PRESS <EN
TER> TO RETURN":EXEC44539:RETURN
177Ø GOTO174Ø
178Ø FORX=1TOR
179Ø IFD$(X,16)="DEAD"THEN183Ø
18ØØ D$(X,13)=STR$(VAL(D$(X,13))
+A)
181Ø D$(X,15)=STR$(VAL(D$(X,15))
+A)
182Ø N=N+1
183Ø NEXTX
184Ø PRINTN"PLAYERS CHANGED"
185Ø X$=INKEY$
186Ø IFINKEY$=""THEN186Ø
187Ø RETURN
188Ø 'NON-KILL PENALTIES
189Ø CLS:P$="NON-KILL PENALTIES"
:GOSUB28ØØ
19ØØ PRINT
191Ø PRINT@96,;:INPUT"HOW MUCH T
O SUBTRACT FROM EACH  ALIVE PLAY
ER";S
192Ø IFS=ØTHENRETURN
193Ø IFS<>ABS(INT(S))THEN189Ø
194Ø FORX=1TOR
195Ø IFD$(X,16)<>"ALIVE"ORD$(X,1
7)="N"THEN2Ø6Ø
196Ø PRINT@192,"NAME: "D$(X,1)"
"D$(X,2)+STRING$(12-LEN(D$(X,2))
,32)
197Ø PRINT"CODENAME: "D$(X,3)"
    "
198Ø PRINT@288,"KILL POINTS:"D$(
X,12)"          "
199Ø PRINT"SUBTRACT"S"POINTS? (Y
/N/Q)"
2ØØØ A$=INKEY$:IFA$=""THEN2ØØØ
2Ø1Ø IFA$="Q"THENRETURN
2Ø2Ø IFA$="N"THEN2Ø6Ø
2Ø3Ø IFA$<>"Y"THEN2ØØØ
2Ø4Ø D$(X,14)=STR$(VAL(D$(X,14))
-S)
2Ø5Ø D$(X,15)=STR$(VAL(D$(X,15))
-S)
2Ø6Ø NEXTX
2Ø7Ø PRINT
2Ø8Ø PRINT"DONE."
2Ø9Ø EXEC44539:RETURN
21ØØ 'PRINT POINTS LIST
211Ø CLS:P$="PRINT POINTS":GOSUB
28ØØ
212Ø PRINT:PRINT"SORTING..."
213Ø POKE65495,Ø
214Ø TV=Ø:TR=Ø:A=Ø:NA=Ø:NU=Ø
215Ø FORX=1TOR
216Ø IFLEFT$(D$(X,16),1)="A"ANDD
$(X,17)="Y"THENNA=NA+1
217Ø NEXTX
218Ø FORX=1TOR
219Ø IFD$(X,17)="N"THEND$(X,18)=
"U":NU=NU+1
22ØØ NEXTX
221Ø FORX=1TOR
222Ø PRINT@Ø,X;
223Ø FORY=1TOR
224Ø IFVAL(D$(Y,15))=>TV ANDD$(Y
```

```
,18)<>"U"THENTV=VAL(D$(Y,15)):TR
=Y
225Ø NEXTY
226Ø IFLEFT$(D$(TR,16),1)="D"THE
N233Ø
227Ø A=A+1
228Ø FORZ=13TO16
229Ø T$(A,Z)=D$(TR,Z)
23ØØ T$(A,3)=D$(TR,3)
231Ø NEXTZ
232Ø GOTO238Ø
233Ø NA=NA+1
234Ø FORZ=13TO16
235Ø T$(NA,Z)=D$(TR,Z)
236Ø T$(NA,3)=D$(TR,3)
237Ø NEXTZ
238Ø D$(TR,18)="U":TV=Ø
239Ø NEXTX
24ØØ FORX=1TOR
241Ø D$(X,18)=""
242Ø NEXTX
243Ø POKE65494,Ø
244Ø PRINT@128,"PRINTING..."
245Ø FORX=1TO6:PRINT#-2,"":NEXTX
246Ø PRINT#-2,TAB(11)"CODENAME"T
AB(24)"KILLS"TAB(34)"BONUSES"TAB
(46)"PENALTIES"TAB(6Ø)"TOTAL"TAB
(7Ø)"STATUS"
247Ø PRINT#-2,TAB(11)"--------"T
AB(24)"-----"TAB(34)"-------"TAB
(46)"---------"TAB(6Ø)"-----"TAB
(7Ø)"------"
248Ø PRINT#-2,""
249Ø FORX=1TO(R-NU)
25ØØ PRINT#-2,TAB(4)T$(X,3)TAB(2
5)T$(X,12)TAB(36)T$(X,13)TAB(49)
T$(X,14)TAB(61)T$(X,15)TAB(71)T$
(X,16)
251Ø NEXTX
252Ø PRINT#-2,CHR$(12);
253Ø RETURN
254Ø 'LIST PLAYERS
255Ø CLS:P$="LIST PLAYERS":GOSUB
28ØØ
256Ø PRINT
257Ø PRINT"PRINT LIST TO PRINTER
? (Y/N/Q)"
258Ø A$=INKEY$:IFA$<>"Y"ANDA$<>"
N"ANDA$<>"Q"THEN258Ø
259Ø IFA$="Q"THENRETURN
26ØØ IFA$="Y"THENP=1ELSEP=Ø
261Ø CLS:FORX=1TOR
262Ø PRINTD$(X,1)" "D$(X,2):PRIN
TTAB(1Ø)D$(X,3)
263Ø IFP THENPRINT#-2,D$(X,1)" "
D$(X,2)TAB(28)D$(X,3)TAB(45)D$(X
,16)
264Ø IFX/7=INT(X/7)THENPRINT@489
,"PRESS <ENTER>";:FORQ=ØTO1STEPØ
:Q$=INKEY$:IFQ$="Q"THENRETURNELS
EIFQ$=""THENNEXTQ ELSECLS
265Ø NEXTX
266Ø PRINT:PRINTR"PLAYERS"
267Ø EXEC44539:RETURN
268Ø 'QUIT
269Ø CLS:PRINT"SAVE DATA? (Y/N)"
27ØØ A$=INKEY$:IFA$="N"THENENDEL
SEIFA$<>"Y"THEN27ØØ
271Ø CLS:PRINT"SAVING DATA..."
272Ø OPEN"O",1,"TAG/DAT"
273Ø PRINT#1,R
274Ø FORX=1TOR
275Ø FORY=1TO17
276Ø PRINT#1,D$(X,Y)
277Ø NEXTY,X
278Ø END
279Ø 'CENTER ROUTINE
28ØØ T=16-LEN(P$)/2
281Ø PRINTTAB(T)P$
282Ø PRINTTAB(T)STRING$(LEN(P$),
"-")
283Ø RETURN
284Ø 'PRINT TITLES ROUTINE
285Ø FORX=1TO11
286Ø AN$=RIGHT$(STR$(X),1)+" - "
287Ø IFX=1ØTHENAN$="1Ø- "
288Ø IFX=11THENAN$="11- "
289Ø PRINT@64+X*32,"";
29ØØ IFAN THENPRINTAN$;
291Ø PRINTD$(Ø,X);
292Ø IFAD THENPRINTD$(N,X)ELSEPR
INT
293Ø NEXTX
294Ø AN=Ø:AD=Ø
295Ø RETURN
296Ø 'INPUT DATA ROUTINE
297Ø I$="":PRINT@L,STRING$(15,32
)
298Ø PRINT@L+LEN(I$),CHR$(191)
299Ø A$=INKEY$:IFA$=""THEN299Ø
3ØØØ IFA$=CHR$(8)ANDLEN(I$) THEN
I$=LEFT$(I$,LEN(I$)-1):PRINTA$;:
GOTO298Ø
3Ø1Ø IFA$=CHR$(21)THEN297Ø
3Ø2Ø IFA$=CHR$(13)THENPRINT@L+LE
N(I$)," ";:RETURN
3Ø3Ø IFASC(A$)<32ORASC(A$)>122TH
EN299ØELSEI$=I$+A$:PRINT@L+LEN(I
$)-1,A$;:GOTO298Ø
3Ø4Ø DATA"FIRST NAME: ","LAST NA
ME:  ","CODENAME:  ","TELEPHONE
:  ","HEIGHT:  ","WEIGHT:
 ","HAIR COLOR: ","EYE COLOR:  "
,"CAR DRIVEN: ","ACTIVITIES: ","
GRADE:  "
3Ø5Ø PCLEAR1:GOTO4Ø
```

If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. Remember, keep your ideas specific, and don't forget this is BASIC. All programs resulting from your wishes are for your use, but remain the property of the author.

Basic vocabulary for elementary students

Matching Opposites

By Fred B. Scerbo
Rainbow Contributing Editor

Inspiration can come from the strangest sources. That's the whole premise on which this column is based. You, the reader, suggest ideas that I can translate into concrete BASIC programs for your Color Computer.

It has been a long time since I have gotten really excited about a project. Don't misunderstand me: I don't mean that recent "Wishing Well" programs have not been up to snuff. It is just that some suggestions can really light a fire in my head. Every now and then it is nice to be so excited about a program idea that I spend every spare minute creating at the CoCo keyboard, even late into the night.

This month's program is the result of just such an inspiration. *Opposites Vol. 1* is a rather long listing designed for the younger, elementary school-aged CoCo user. It is also the basis for a new "Wishing Well" game that will appear in next month's RAINBOW as well as a few new programming techniques I will introduce to you.

The Motivation

Several months ago I put out a request for old gray CoCos that were gathering dust in people's closets. Since that time, over a dozen kind souls have donated CoCos, disks or disk drives to our special needs program here at Drury High School. As a result, our resource room is now using the Color Computers every single period of the day with either word processing or skills reviews. We are never without a free machine for a student who needs to use one. That is great!

That was not the end of my effort, however. In recent weeks I have been able to patch together three more complete systems, using cassettes and some old black-and-white TV sets. (We can always still find good homes for other retired CoCos!) With the three systems in hand, I went to our city's oldest elementary school, originally built around the turn of the century. It is one of our few truly "neighborhood" schools left; in fact, I was there as a student back in the late '50s.

We have three special needs classes at that school, dealing with students who have simple learning disabilities to those with severe emotional and physical handicaps. Among the three classes there was only one computer, an old Atari 800 with only about a dozen or so working programs. In other words, these three classes had no real computer contact at all.

This school was the perfect location for three of these donated CoCos. Without going into great detail, I can now say that just a few weeks later, the Color Computers have become an integral part of each classroom, in use almost every period of the day. All the software used is coming directly from the pages of THE RAINBOW, either from past "Wishing Well" programs or other authors' submissions.

The Inspiration

Naturally, these three teachers are just thrilled to have this added resource in their classes. However, I have not written much software for very young students, especially those with special needs; I normally work with high school students. I was wide open for any suggestions for programs.

After about a week one of the teachers commented, "These programs are just great, but do you have anything on opposites?"

Opposites! That may seem like too simple a category to cover in a computer program, but keep in mind that special needs students have a real conceptual blockage at times. They may know that hot and cold are similar, but they do not really understand what opposite means. This seemed like a good challenge. Besides, mainstream youngsters could use it, too.

The closest I had come to a program on opposites was my old *Homonyms* program, which could be used with antonyms, as well. However, what the teacher seemed to need was something quite different. Some of her students were only 5 or 6 years old. A text program didn't seem to fit the bill.

She needed something that would really emphasize the opposite nature of two terms, such as over and under, up and down, or happy and sad. The only way to accomplish this in a way that would be useful to the really young required the use of graphics.

The Graphics

At last I had a valid excuse to get back into some exciting graphics creations. As you will recall, it has been some time since creations like *Rockfest* or *Football Fever* showed how to construct impressive CoCo graphics from BASIC. This would be a good opportunity to incorporate simple graphics with concepts. However, some concepts would be harder to represent than others, as I would soon find.

I felt the most effective graphics would be both easily recognizable and large. To accommodate the size, I chose to work in PMODE0.

PMODE0? Don't get excited. There are four very logical reasons for using our lowest-grade high resolution. First, the pixels for PMODE0 are perfect squares only slightly larger than in PMODE4. Second, one screen in PMODE0 occupies only one graphics page; in a regular power-up there are automatically four graphics pages to use, allowing the rapid use of PCOPY in creating screens.

Third, drawing large graphics in

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PMODE0 will lend itself perfectly to reduction using the S (size) command in our DRAW statement. (Sometimes when you enlarge or reduce using S, you will get a distorted graphic, especially when using diagonals E, F, G and H. This eliminates the problem.)

Finally, using PMODE0 allows a sharp black-and-white image without color distortion found in the thin lines drawn in PMODE4. Since I want to easily convey a concept in a graphic, straight black and white is the best route to go. Besides, all three CoCo stations I set up were with black-and-white TV sets!

The Program

I do not want to go to great length in explaining the listing, since it is very long due to the amount of data used. Instead, let's simply take a quick look at what the program involves.

There are 40 graphics strings for drawing concepts and text. This makes 20 sets of two opposite matches: up and down, left and right, etc. I chose not to create a graphics set of alphanumeric characters this time, so each string is self-contained with all the information it needs to draw a complete graphic. This may seem the long way of doing things, but it speeds up execution of the drawing.

In a review section the user can run through each of the 20 sets on the screen alone. There is also a quiz that will highlight a graphic and ask the user to choose the correct opposite match by moving the flashing cursor with the space bar. All the choices are presented randomly, so the program is fairly unlimited in its variety.

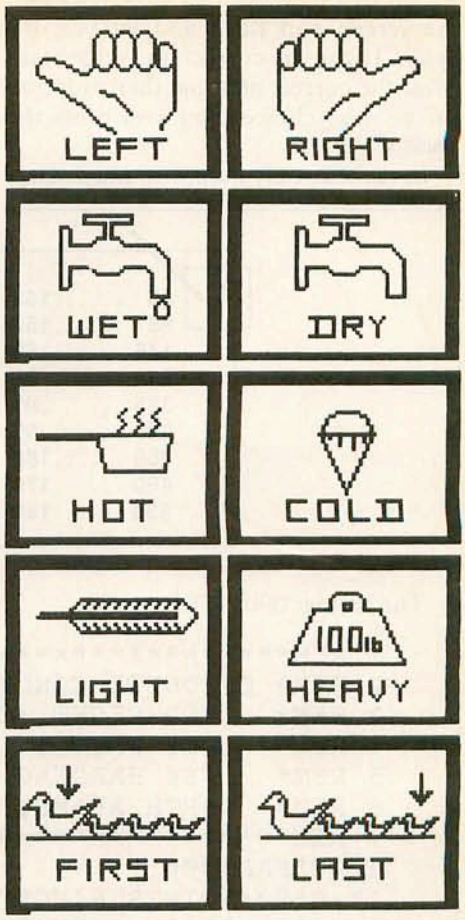
A third option is a quiz involving the words only. This allows a good test of whether the concepts have been related to the correct terms.

Using the Program

After the titlecard comes a menu of three choices. The first choice allows review of terms and graphics. Use the ENTER key to advance to each of the next graphics. At the end of the review, the program will rerun itself.

Both quiz sections allow you to check your score by pressing the @ key. You may continue with either quiz by pressing C to continue.

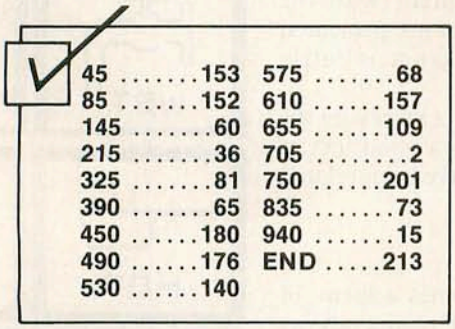
In the graphics quiz, pressing the space bar moves the cursor around the screen. Press ENTER when you are on the correct match. If you are incorrect,



the screen will flash and let you try again. If you are correct, the screen will show the correct pair and then move on to the next choice after you press the ENTER key.

In the text-only quiz, you must select the correct response — 1, 2 or 3. You will get only one try on each term. The screen will indicate if you are correct or incorrect.

As you can tell from the program's title, there will be an *Opposites Vol. 2* very soon. It will cover somewhat more difficult concepts than this first version. However, next month I'll have the game I have been promising you for months, and it will have a great deal to do with what we have covered this month. □



45	153	575	68
85	152	610	157
145	60	655	109
215	36	705	2
325	81	750	201
390	65	835	73
450	180	940	15
490	176	END	213
530	140		

The listing: OPOSITE1

```
1 REM**************************
2 REM* OPPOSITE CONCEPTS VOL.1 *
3 REM*   COPYRIGHT (C) 1988    *
4 REM*    BY FRED B. SCERBO    *
5 REM*    6Ø HARDING AVENUE    *
6 REM*  NORTH ADAMS, MA Ø1247  *
7 REM**************************
1Ø CLEAR3ØØØ
15 CLSØ:PRINTSTRING$(32,188);STR
ING$(32,156);:FORI=1TO 256 :READ
 A:PRINTCHR$(A+128);:NEXT
2Ø PRINTSTRING$(32,195);STRING$(
32,179);
25 PRINT@422,"  BY FRED B.SCERBO
  ";:PRINT@454," COPYRIGHT (C) 1
988 ";
3Ø DATA126,124,124,125,117,124,1
24,122,126,124,125,117,124,124,1
25,117,124,124,124,116,126,117,1
24,126,125,117,124,124,117,124,1
24,124
35 DATA122,,,117,117,115,115,122
,123,115,119,117,,,117,117,115,1
15,115,,122,,,122,,117,115,114,1
17,115,115,115
4Ø DATA122,,,117,117,,,,122,,,11
7,,,117,,,,117,,122,,,122,,117,,
,,,,117
45 DATA124,124,124,124,116,,,32,
12Ø,,,116,124,124,124,116,124,12
4,124,116,124,,116,124,,116,124,
124,116,124,124,124
5Ø DATA46,44,44,45,37,,,32,42,,,
37,44,44,45,36,44,44,45,36,46,,3
6,46,32,37,44,44,36,44,44,45
55 DATA42,,,37,37,35,35,34,43,35
,35,37,,,37,33,35,35,39,,42,,,42
,,37,35,34,33,35,35,39
6Ø DATA42,,,37,37,,,42,42,,37,37
,,,37,37,32,,,,42,33,32,42,33,37
,,,37,,,
65 DATA44,44,44,44,36,44,44,4Ø,4
4,44,44,36,44,44,44,36,44,44,44,
36,44,36,44,44,44,36,44,44,36,44
,44,44
7Ø X$=INKEY$:IFX$<>CHR$(13)THEN7
Ø
75 DIM P$(2Ø,2),A$(6),B$(2Ø),C$(
2Ø),A(2Ø),N(2Ø),B(4),C(4),D(4),E
(4),F(4),AO(2Ø)
8Ø FORI=1TO3:READ C(I),D(I),E(I)
,F(I):NEXT:FORI=1TO6:READA$(I):N
EXT:FORI=1TO2Ø:READP$(I,1),B$(I)
,P$(I,2),C$(I):NEXT
85 COLOR1,Ø:P$(8,2)=P$(8,1):P$(8
,1)=P$(8,1)+"BU28BR4F6NU16NE6U2N
H4NE4BD36BL6NR1ØD4NR1ØD6BR18NU1Ø
BR8U1ØR1ØD4L1ØR4F6BR6R1ØU6L1ØU4R
1ØBR6R6ND1ØR6"
9Ø P$(8,2)=P$(8,2)+"BU24BR74F6NU
16NE6U2NH4NE4BD42BL74NU1ØR8BR6U6
NR1ØU4R1ØD1ØBR6R1ØU6L1ØU4R1ØBR6R
6ND1ØR6"
95 CLS:PRINTSTRING$(32,"=");:PRI
NT@68,"OPPOSITE CONCEPTS VOL.1":
PRINT@134,"A) REVIEW ALL TERMS":
PRINT@198,"B) QUIZ GRAPHICS":PRI
NT@262,"C) QUIZ TERMS ONLY"
1ØØ PRINT@324,"<<<SELECT YOUR CH
OICE>>>"
1Ø5 PRINT:PRINTSTRING$(32,"=");:
PRINT@42Ø,"DEDICATED TO THE STUD
ENTS":PRINTTAB(8)"OF JOHNSON SCH
OOL"
11Ø X$=INKEY$:X=RND(-TIMER):IFX$
="A"THEN365ELSEIFX$="B"THEN115EL
SEIFX$="C"THEN795ELSE11Ø
115 CLSØ:PMODEØ,1:PCLS1
12Ø LINE(Ø,Ø)-(254,17Ø),PRESET,B
125 LINE(6,4)-(122,82),PRESET,BF
13Ø LINE(128,4)-(248,82),PRESET,
B
135 LINE(6,86)-(122,164),PRESET,
B
14Ø LINE(128,86)-(248,164),PRESE
T,B
145 DRAW"BM26,188CØNU1ØR1ØNU1ØBR
6R1ØU6L1ØU4R1ØBR6NR1ØD4NR1ØD6R1Ø
BR12BU6NE4D2F4BR6R1ØU6L1ØU4R1ØBR
6ND1ØR1ØD4NL1ØBR6NR1ØD6U1ØR1ØD1Ø
BR6NR1ØU1ØR1ØBR6NR1ØD4NR1ØD6R1ØB
R1ØU1ØNL4R1ØD4NL1ØD6NL14BR6U1ØR1
ØD4NL1ØD6BR6U1ØR1ØD4L1ØR4F6BR6E4
U2H4"
15Ø DATA13Ø,6,246,8Ø,6,86,12Ø,16
```

```
2,13Ø,86,246,162
155 PAINT(2,2),Ø,Ø:PCOPY1TO3
16Ø PMODEØ,4:PCLS1
165 LINE(Ø,Ø)-(254,17Ø),PRESET,B
F
17Ø LINE(8,6)-(12Ø,8Ø),PSET,BF
175 PCOPY4TO2:PMODEØ,1:SCREEN1,1
18Ø DATA"BM2,8C1","BM13Ø,8CØ","B
M2,9ØCØ","BM13Ø,9ØCØ","BM2,48CØ"
,"BM13Ø,48CØ"
185 FORI=1TO2Ø
19Ø A(I)=RND(2Ø):IFN(A(I))=1THEN
19Ø
195 N(A(I))=1:NEXTI:FORY=1TO2Ø:C
OLOR1,Ø
2ØØ FORI=2TO4
2Ø5 B(I)=RND(3)+1:IFN(B(I))=ØTHE
N2Ø5
21Ø N(B(I))=Ø:NEXTI:FORI=1TO4:N(
I)=1:NEXT
215 B=RND(2Ø):IFB=A((Y))THEN215
22Ø C=RND(2Ø):IFC=B OR C=A((Y))T
HEN22Ø
225 DRAW A$(1):DRAWP$(A(Y),1)
23Ø DRAW A$(B(2)):DRAWP$(B,2)
235 DRAW A$(B(3)):DRAWP$(C,2)
24Ø DRAW A$(B(4)):DRAWP$(A(Y),2)
245 COLOR1,Ø
25Ø Z=Ø
255 PMODEØ,4
26Ø DRAW A$(1)+"CØ":DRAWP$(A(Y),
1)
265 DRAW A$(B(2))+"C1":DRAWP$(B,
2)
27Ø DRAW A$(B(3))+"C1":DRAWP$(C,
2)
275 DRAW A$(B(4))+"C1":DRAWP$(A(
Y),2)
28Ø PMODEØ,1:SCREEN1,1
285 LINE(8,6)-(12Ø,8Ø),PSET,B
29Ø X$=INKEY$:IFX$=" "THEN3ØØELS
EIFX$="@"THEN965
295 COLOR1,Ø:LINE(8,6)-(12Ø,8Ø),
PRESET,B:GOTO285
3ØØ Z=Z+1:IFZ=4THENZ=1
3Ø5 COLOR1,Ø:LINE(C(Z),D(Z))-(E(
Z),F(Z)),PSET,B
31Ø X$=INKEY$:IFX$=" "THEN3ØØELS
EIFX$=CHR$(13)THEN32ØELSEIFX$="@
"THEN965
315 COLOR1,Ø:LINE(C(Z),D(Z))-(E(
Z),F(Z)),PRESET,B:GOTO3Ø5
32Ø IFZ+1=B(4)THEN33Ø
325 NW=NW+1:FORK=1TO5:PMODEØ,4:S
CREEN1,1:SOUND1Ø,3:PMODEØ,1:SCRE
EN1,1:SOUND1,3:NEXTK:GOTO3Ø5
33Ø NC=NC+1:PMODEØ,4:PCLS1:LINE(
Ø,4Ø)-(256,126),PRESET,B:LINE(6,
```

```
44)-(124,122),PRESET,B:LINE(13Ø,
44)-(248,122),PRESET,B:PAINT(2,4
2),Ø,Ø
335 DRAW A$(5):DRAWP$(A(Y),1)
34Ø DRAW A$(6):DRAWP$(A(Y),2)
345 SCREEN1,1
35Ø X$=INKEY$:IFX$<>CHR$(13)THEN
35Ø
355 PMODEØ,1
36Ø PCOPY3TO1:SCREEN1,1:PCOPY2TO
4:NEXTY:GOTO965
365 PMODEØ,2:PCLS1:SCREEN1,1:LIN
E(Ø,4Ø)-(256,126),PRESET,B:LINE(
6,44)-(124,122),PRESET,B:LINE(13
Ø,44)-(248,122),PRESET,B:PAINT(2
,42),Ø,Ø
37Ø FORI=1TO2Ø:DRAW A$(5):DRAWP$
(I,1)
375 DRAW A$(6):DRAWP$(I,2)
38Ø X$=INKEY$:IFX$<>CHR$(13)THEN
38Ø
385 COLOR1,Ø:LINE(8,46)-(122,12Ø
),PSET,BF:LINE(132,46)-(246,12Ø)
,PSET,BF:NEXTI
39Ø RUN
395 DATA"BR6ØBD4F2ØL1ØD24L2ØU24L
1ØE2ØBD52BL14D1ØR1ØU1ØBR8ND1ØR1Ø
D6L1Ø"
4ØØ DATA UP
4Ø5 DATA"BR6ØBD4L1ØD24L1ØF2ØE2ØL
1ØU24L1ØBD52BL32R4ND1ØR1ØD1ØL14B
R2ØU1ØR1ØD1ØNL1ØBR6NU1ØR6NU8R6NU
1ØBR6U1ØF1ØU1Ø"
41Ø DATA DOWN
415 DATA"BR16BD2ØR8ØM-4,+2ØL36M-
4,-18NL36BR12BU4E4UH4UE4BR1ØG4DF
4DG4BR1ØE4UH4UE4BD5ØBL5ØD1ØU6R1Ø
U4D1ØBR8U1ØR1ØD1ØNL1ØBR12U1ØL6R1
2"
42Ø DATA HOT
425 DATA"BR6ØBD2ØL4ND6L6ND2L4ND4
L2M+16,+32M+16,-32L16R4ND8R6ND4R
6L2U4H2U2H2L2H2L12G2L2G2D2G2D4BD
36BL1ØL1ØD1ØR1ØBR8U1ØR1ØD1ØNL1ØB
R8NU1ØR1ØBR6R14U1ØL14R4D1Ø"
43Ø DATA COLD
435 DATA"BR1ØBD14R26F4D16G4L22NU
24D24L4R26E4U16H4BR12U24NL4NR4D4
8NL4R4BR1ØH4U4ØE4R16F4D1ØBD1ØNL1
6D2ØG4L14BR24R4U3ØR4U1ØR2U1ØE2U6
RD6F2D1ØR2D1ØR4D3ØR4L22BR8BU2U24
BR4D24"
44Ø DATA BIG
445 DATA"BR38BD56D8R4BR4U8BR4R2N
D8R2BR4R2ND8R2BR4D8R4BR4NR4U4NR4
U4NR4BU6BL6H4L4U2NR4D2L4NUND4L4U
2L4D2R4NH6L2G4"
45Ø DATA LITTLE
455 DATA"BR24BD36E12G6F2ØR2ØE2ØF
6H12BL14H2G4L4H4G2BU1ØBL4NU4L2U6
E4R2BR26L2G4D6L2U4BD56BL46U1ØD4R
1ØU4D1ØBR6U1ØNR1ØD4R1ØU4D1ØBR6U1
ØR1ØD4L1ØD6BR16U1ØR1ØD4L1ØBR18BD
6U6NH4NE4"
46Ø DATA HAPPY
465 DATA"BR34BD5ØH12F6E12R36F12G
6E12BU16BL28H2G4L4H4G2BU1ØBL4NU4
L2U6E4R2BR26L2G4D6L2U4BD58BL34R1
ØU6L1ØU4R1ØBR6NR1ØD4NR1ØD6BR1ØNU
1ØBR6R4U1ØL4R14D1ØL1Ø"
47Ø DATA SAD
475 DATA"BR2ØBD22D2ØM+3Ø,+1ØNU2Ø
R5ØU2ØNL5ØM-3Ø,-1ØND8L5ØM+3Ø,+1Ø
M-3Ø,-1ØE2ØR5ØG2ØL1ØNE2ØL1ØNE2ØL
1ØNE2ØL1ØNE2ØBD34BR6NR1ØD1ØR1ØNU
1ØBR6U1ØR6D4L6D6BR12NR6U6NR6U4R6
BR6ND1ØF1ØU1Ø"
48Ø DATA OPEN
485 DATA"BR12BD16D2ØM+3Ø,+1ØNU2Ø
R6ØU2ØNL6ØM-3Ø,-1ØL6ØM+3Ø,+1ØR12
M-3Ø,-1ØR12M+3Ø,+1ØR12M-3Ø,-1ØR1
2M+3Ø,+1ØBD4ØBL78NR1ØU1ØR1ØBD1ØB
R6NU1ØR8BR6U1ØR1ØD1ØNL1ØBR6R1ØU6
L1ØU4R1ØBR6NR6D4NR6D6R6BR6R4NU1Ø
R1ØU1ØL14"
49Ø DATA CLOSED
495 DATA"BR9ØBD52U2E8U32H4L4G2D1
ØF2R4E4BL12U12H4L4G4D12F4R4E4BL1
2U12H4L4G4D12F4R4E4BL12U12H4L4G4
D12F4R4E4BL12D2G4L4M-1Ø,-6M-1Ø,-
2L2G4D4M+8,+4D2M+2Ø,+12F1ØM+6,+2
F2BE1ØH1ØM-8,-3BD36BL2ØNU1ØR1ØBR
6NR8U6NR8U4R8BR6NR1ØD4NR1ØD6BR22
U1ØL6R12"
5ØØ DATA LEFT
5Ø5 DATA"BR28BD52U2H8U32E4R4F2D1
ØG2L4H4BR12U12E4R4F4D12G4L4H4BR1
2U12E4R4F4D12G4L4H4BR12U12E4R4F4
D12G4L4H4BR12D2F4R4M+1Ø,-6M+1Ø,-
2R2F4D4M-8,+4D2M-2Ø,+12G14G2BH1Ø
E1ØM+8,-3BD24BL4ØND1ØR1ØD4L1ØR4F
6BR6NU1ØBR6U1ØNR1ØD1ØR1ØU6NL4BR6
NU4ND6R1ØU4D1ØBR1ØU1ØL6R1
51Ø DATA RIGHT
515 DATA"BR3ØBD6D34R4E2U1ØR12F4R
12E4R12F4D12R1ØU2ØH8L18H4L4U8R12
U4L28D4R12D8L4G4L12U8H2L4BM+6Ø,+
4ØF4D4G2L4H2U4E4BL54BD1ØD1ØR6NU8
R6NU1ØBR6NR8U6NR8U4R8BR6R6ND1ØR6
"
52Ø DATA WET
525 DATA"BR3ØBD6D34R4E2U1ØR12F4R
12E4R12F4D12R1ØU2ØH8L18H4L4U8R12
U4L28D4R12D8L4G4L12U8H2L4BD5ØBR8
R4ND1ØR1ØD1ØNL14BR6U1ØR1ØD4L1ØR4
F6BR1ØU6NH4E4"
53Ø DATA DRY
535 DATA"BR1ØBD4ØR1Ø2L8E1ØM-8,+4
L6U4H2L2G4R4D4F4L2ØE1ØM-8,+4L6U4
H2L2G4R4D4F4L2ØE1ØM-8,+4L6U4H2L2
G4R4D4F4L2ØE2ØM-16,+8L12U8H4L4G8
R8BE4NLBG4D8F8"
```

```
54Ø DATA FIRST
545 DATA BR2
55Ø DATA LAST
555 DATA"BR56BD26M+18,+5F8LH2L2G
2H2L2G2H2L2G2H2L2G3D11GLNHREU11H
3L2G2H2L2G2H2L2G2H2L2G2E8M+18,-5
BU1ØR1ØE4NH4R6E4U2H4L1ØG4L12NG4H
6L8G4D6F4R6F4R4E2R2R6R4BR16NE6NR
2ØNF6BD5ØBL5ØU1ØR1ØD1ØNL1ØBR6BU4
NU6F4E4U6BR6NR1ØD4NR1ØD6R1ØBR6U1
ØR8D4L6F6"
56Ø DATA OVER
565 DATA"BR56BD2M+18,+5F8LH2L2G2
H2L2G2H2L2G2H2L2G3D9GLNHREU9H3L2
G2H2L2G2H2L2G2H2L2G2E8M+18,-5BD3
6NE6NH6NG6NF6BR16NE6NF6R22BD28BL
74NU1ØR1ØNU1ØBR6U1ØF1ØNU1ØBR6R4U
1ØL4R14D1ØNL1ØBR6NR1ØU6NR1ØU4R1Ø
BR6ND1ØR8D4L8R2F6"
57Ø DATA UNDER
575 DATA"BR16BD2ØE2NR8ØR16E8R6NG
4R6NG4R6NG4R6NG4R6NG4R6NG4NG4R6N
G4R6NG4R6NG4R6NG4F8D2G8NH4L6NH4L
6NH4L6NH4L6NH4L6NH4L6NH4L6NH4L6N
H4L6NH4L6H8L16NR8ØBD46BR1ØNU1ØR8
BR6NU1ØBR6U1ØR1ØBD4NL4D6NL1ØBR6U
6NU4R1ØU4D1ØBR12U1ØL6R12"
58Ø DATA LIGHT
585 DATA"BR26BD46R68M-14,-3ØL1ØU
6H4L12G4D6L1ØM-14,+3ØBR18BU8U12B
R6NR6D12R6NU12BR6U12R6D12NL6BR4N
U6BR4NU6U4R4D4L4BU22BL14L4U4R4D4
BD5ØBL36U1ØD4R1ØU4D1ØBR6NR1ØU6NR
1ØU4R1ØBR6ND1ØR1ØD4NL1ØD6BR6BU4N
U6F4E4U6BR6F4ND6E4"
59Ø DATA HEAVY
595 DATA"BR6ØBD48R8E4U1ØR4U6L4U6
H4L16G4D6L4D6R4D1ØF4R8BU6NE4NH4B
U8NLNR2BU6BL4NR2BR6R2BU16R6E2H2L
2ØG2F2R12BD2ØBL2ØH16D16F16R36E16
U16G16BD34BL5ØU1ØR1ØBD4NL4D6NL1Ø
BR6U1ØR1ØD1ØNL1ØBR6U1ØR1ØD1ØNL1Ø
BR6R4NR1ØU1ØL4R14D1Ø"
6ØØ DATA GOOD
6Ø5 DATA"BR6ØBD48R8E4U1ØR4U6L4U6
H4L16G4D6L4D6R4D1ØF4R8BU1ØNG4NF4
BU4NLNR2BU6BL4NR2BR6R2BU12E6D8L2
ØU8F6BL2ØD6G4L6NU1ØND2ØL6H4U6BR7
8NG4NF4D2ØG1ØBD2ØBL48U1ØR1ØD4NL1
ØD6NL1ØBR6U6NR1ØU4R1ØD1ØBR6R4NR1
ØU1ØL4R14D1Ø"
61Ø DATA BAD
615 DATA"BR2ØBD16D3ØNR56U3ØR6U16
R1ØF4G4L1ØD8R1ØD6R1ØD6R1ØD6R1ØD6
R1ØD6R26BU42BL3ØL2ØNE4NF4BD52BL2
ØD1ØU6R1ØU4D1ØBR8NU1ØBR8NR1ØU1ØR
1ØBD4NL4D6BR6U1ØD4R1ØU4D1Ø"
62Ø DATA HIGH
625 DATA"BR2ØBD16D3ØNR56U3ØR16D6
R1ØD6R1ØD6R1ØD6R1ØD6R26L16U16R1Ø
F4G4L1ØD8BU26BR6NU16NH4NE4BD46BL
5ØNU1ØR8BR6U1ØR1ØD1ØNL1ØBR6NU1ØR
6NU8R6U1Ø"
63Ø DATA LOW
635 DATA"BR32BD26NR5ØD2NR5ØD2R5Ø
D6L2D4R14U4L2U12H2U4H2U2H4L6D2F2
D2F2D8BL5ØBD3ØD4ND6R1ØD6U1ØBR6ND
1ØR1ØD4NL1ØD6BR6U1ØR1ØD4L1ØR4F6B
R6R4NU1ØR1ØU1ØL14"
64Ø DATA HARD
645 DATA"BR36BD18H8U8R8F8E4R2ØF4
E8R8D8G8D1ØG4D2G8L2G4L8H4L2H8U2H
4U1ØBR1ØBD4R4NU2ND2NR4NE2NH2BR12
R4NU2ND2NR4NE2NH2BG8BD4NE4NH4D6N
F4NG4U6BR6NR2ØBL12NL2ØBR6D4BF4NF
1ØBH4BG4G1ØBL14BD14R1ØU6L1ØU4R1Ø
BR6ND1ØR1ØD1ØNL1ØBR6U6NR1ØU4R1ØB
R6R6ND1ØR6"
65Ø DATA SOFT
655 DATA"BR3ØBD2D1ØNR3ØD4NR3ØL2D
4L2D4L2D4L2D12NR88D6R8NU6R8NU6R8
NU6R8NU6R8NU6R8NU6R8NU6R8NU6R8NU
6R8NU6R8U6U4H4M-1Ø,-4L4ND1ØM-3Ø,
-1ØNU16NE6D4M+3Ø,+1ØBL58ND8NH8BD
22BR16ND1ØR1ØD1ØNL1ØBR6U1ØF1ØU1Ø
"
66Ø DATA ON
665 DATA"BR26BD2D14L2D4L2D4L2D4L
2D12F6R2ØE2R3ØF2R14E2F2R1ØE2U6H2
L1ØH2L8M-3Ø,-1ØH4U18BL18BD2ØG4D4
F4BD2ØD1ØR1ØU1ØNL1ØBR6NR1ØD4NR1Ø
D6BR16U6NR1ØU4R1Ø"
67Ø DATA OFF
675 DATA"BR2ØBD6ND2ØR8ØG1ØNL5ØM+
1Ø,+3ØG4L62H4M+1Ø,-3ØH4L8D14L6BD
3ØBR16NR1ØD4NR1ØD6BR16NU1ØR1ØNU1
ØBR6NU1ØR8BR4NU1ØR8"
68Ø DATA FULL
685 DATA"BR2ØBD6ND2ØR8ØG1ØM+1Ø,+
3ØG4L62H4M+1Ø,-3ØH4L8D14L6BD3ØNR
1ØD4NR1ØD6R1ØBR6U1ØR6ND6R6D1ØBR6
U1ØR1ØD4NL1ØBR6BU4R6ND1ØR6BR6F4N
D6E4"
69Ø DATA EMPTY
695 DATA"BR5ØBD14ND2ØR12D1ØNL12N
D1ØBR8R6NU6ND6R6BR1ØU18L6ØD36R6Ø
U18BD3ØBL6ØNL4ND1ØR1ØD4NL1ØD6NL1
4BR6NR1ØU6NR1ØU4R1ØBR6BD1ØR1ØU6L
```

```
1ØU4R1ØBR6R6ND1ØR6"
7ØØ DATA BEST
7Ø5 DATA"BR5ØBD14ND2ØR12BD1ØNL12
BR8R12BR1ØU18L6ØD36R6ØU18BD3ØBL7
ØD1ØR6NU8R6U1ØBR6ND1ØR1ØD1ØNL1ØB
R6U1ØR1ØD4L1ØR4F6BR6R1ØU6L1ØU4R1
ØBR6R6ND1ØR6"
71Ø DATA WORST
715 DATA"BR3ØBD4ND6R6ØD6NL6ØD4L6
ØNU4G4D28F4R6ØE4U28H4BL2ØBD32H4L
4U2NR4D2L4NUND4L4U2L4D2R4NH6L2G4
BD1ØBL26ND1ØBR6ND1ØF1ØU1ØBR6BD1Ø
R1ØU6L1ØU4R1ØBR6ND1ØBR6R4ND1ØR1Ø
D1ØNL14BR6NR1ØU6NR1ØU4R1Ø"
72Ø DATA INSIDE
725 DATA"BR12BD4ND6R6ØD6NL6ØD4L6
ØNU4G4D28F4R6ØE4U28H4BR36BD32H4L
4U2NR4D2L4NUND4L4U2L4D2R4NH6L2G4
BD1ØBL76ND1ØR1ØD1ØNL1ØBR6NU1ØR1Ø
U1ØBR6R6ND1ØR6BR6BD1ØR1ØU6L1ØU4R
1ØBR6ND1ØBR6R4ND1ØR1ØD1ØNL14BR6N
R8U6NR8U4R8"
73Ø DATA OUTSIDE
735 DATA"BR16BD3ØNR3ØU2NR3ØU2R18
BR4R2BR4R2BL3ØU2R9ØG12M-48,+4U1Ø
BD36BL22R1ØU6L1ØU4R1ØBR6D1ØU6R1Ø
U4D1ØBR6U1ØR1ØD4NL1ØD6BR6U1ØR1ØD
4L1ØR4F6BR6U1ØR1ØD4L1Ø"
74Ø DATA SHARP
745 DATA"BR16BD3ØNR4ØH2U4E2R4ØND
8R48F2D2G2L2G2L2G2L36H2BD36BL28R
4NU1ØR1ØU1ØNL14BR6D1ØR1ØU1ØBR6D1
ØR8BR6NU1ØR8"
75Ø DATA DULL
755 DATA"BR22BD6R3ØD6F4R8E4U6R3Ø
D16L8NU16L8D26L22NU3ØL22U26L8NU1
6L8U16BD6ØNR1ØU1ØR1ØBR6D1ØR8BR6N
R1ØU6NR1ØU4R1ØBR6ND1ØR1ØD4NL1ØD6
BR6U1ØF1ØU1Ø"
76Ø DATA CLEAN
765 DATA"BR22BD6R3ØD6F4R8E4U6R3Ø
D16L8NU16L8D26L8NU12L4NU2ØL2NU8L
4NU6L4NU3ØL8NU12L4NU2ØL2NU8L4NU6
L2NU18L2U26L8NU16L8U16BD5ØR4ND1Ø
R1ØD1ØNL14BR8NU1ØBR8U1ØR1ØD4L1ØR
4F6BR6BU1ØR6ND1ØR6BR6F4ND6E4"
77Ø DATA DIRTY
775 DATA"BR2ØBD3ØNR84BD36BL6R1ØU
6L1ØU4R1ØBR6ND1ØR6ND8R6D1ØBR6U1Ø
R1ØD1ØNL1ØBR6U1ØR1ØD1ØNL1ØBR6BU1
ØR6ND1ØR6BR6D1ØU6R1ØU4D1Ø"
78Ø DATA SMOOTH
785 DATA"BR14BD3ØBRE4R4F4R4E4R4F
4R4E4R4F4R4E4R4F4R4E4R4F4R4E4R4F
4BL84BD36U1ØR1ØD4L1ØR4F6BR6U1ØR1
ØD1ØNL1ØBR6NU1ØR1ØNU1ØBR6U1ØR1ØB
D4NL4D6NL1ØBR6U1ØD4R1ØU4D1Ø"
79Ø DATA ROUGH
795 CLS:V=1
8ØØ FORI=1TO2Ø
8Ø5 AO(I)=RND(2Ø)
81Ø IF N(AO(I))=1 THEN 8Ø5
815 N(AO(I))=1:NEXTI
82Ø FOR P=1TO2Ø
825 CLS
83Ø PRINT@68,"WHAT IS THE OPPOSI
TE OF"
835 PRINT@132,C$(AO(P))+" ?"
84Ø FOR Q=1TO2
845 C(Q)=RND(2Ø):IF C(Q)=AO(P) T
HEN845
85Ø FOR K=Q-1 TO ØSTEP-1:IF C(K)
=C(Q) THEN845
855 NEXTK
86Ø NEXTQ:C(3)=AO(P)
865 FOR E=1TO3
87Ø F(E)=RND(3)
875 FOR K=E-1 TO Ø STEP-1:IF F(K
)=F(E) THEN87Ø
88Ø NEXTK:NEXTE
885 PRINT
89Ø PRINTTAB(8)"1-"+B$(C(F(1))):
PRINT
895 PRINTTAB(8)"2-"+B$(C(F(2))):
PRINT
9ØØ PRINTTAB(8)"3-"+B$(C(F(3))):
PRINT
9Ø5 G$=INKEY$:IFG$="@"THEN965
91Ø IF G$=""THEN9Ø5
915 G=VAL(G$)
92Ø IF G<1 THEN 9Ø5
925 IF G>5 THEN 9Ø5
93Ø IF C(F(G))<>AO(P) THEN945
935 PRINT:PRINT"  RIGHT! THE ANS
WER IS: "+B$(AO(P))
94Ø NC=NC+1:GOTO955
945 PRINT:PRINT"   SORRY! THE AN
SWER IS: "+B$(AO(P))
95Ø NW=NW+1
955 X$=INKEY$:IFX$<>CHR$(13)THEN
955
96Ø NEXT P
965 CLS:PRINT@1Ø1,"YOU TRIED"NC+
NW"TIMES &":PRINT@165,"ANSWERED"
NC"CORRECTLY"
97Ø PRINT@229,"WHILE DOING"NW"WR
ONG."
975 NQ=NC+NW:IF NQ=ØTHEN NQ=1
98Ø MS=INT(NC/NQ*1ØØ)
985 PRINT@293,"YOUR SCORE IS"MS"
%."
99Ø PRINT@357,"ANOTHER TRY (Y/N/
C) ?";
995 X$=INKEY$:IFX$="Y"THEN RUN
1ØØØ IFX$="N"THENCLS:END
1ØØ5 IFX$="C"THEN1Ø15
1Ø1Ø GOTO995
1Ø15 IFV=1THEN825
1Ø2Ø IFV=ØTHEN28Ø
```

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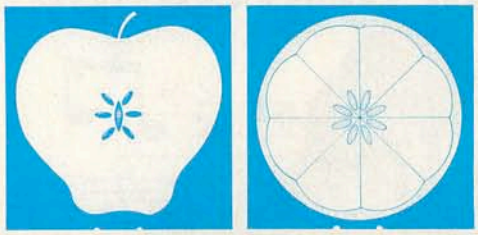
A routine to convert a machine language program into BASIC



ML-DATA

By Stephen Miller

Many times I get programs that try in vain to load a machine language subroutine program, or my favorite picture needs two or three disks in order to dump it to the printer.

I worked out a routine to take an ML program in memory and convert it into BASIC DATA lines that can be added to a program and keep the entire kit together. I was doing some experiments with the saving of ASCII files when it became apparent that this mixing of apples and oranges could in fact be done.

Before loading the program, type in and enter CLEAR size and address for the ML program. Then load *ML-Data* and run it. The opening prompts will again ask you for the CLEAR parameters and the filename for the ML subroutine you want to transfer. Remember to use &H for the address. You will also be asked for the "line number to return to." After the BASIC program created by *ML-Data* pokes in its ML code, it has to know where to go in your BASIC program. Then the program will load the ML package and ask you for the start and end addresses for the ML program. The program will open a data file on disk, then send out to the disk the READ and POKE information to reconstruct your ML routine later. Sit back and watch the fun.

The program will look in memory at the ML program and assign the HEX notation found to A$. Once 70 bytes have been accumulated, A$ will be dumped to the disk and reset, and the program will continue to build the next DATA line number. All along, you will be able to view the complete line number and present addresses flashing by. Once it reaches the end address, the program will close the file and indicate that the job is done.

Now load in your BASIC program where you want the *ML-Data* package to go. Make sure you have room above Line 10000. Now enter MERGE"DATA-FILE". This program will then create a new Line 0 to clear the memory for the ML routine. When this is done, call up a list. When you're ready to use your ML package, use the EXEC&H*xxxx* command where needed. You could also use the DEFUSR command if information is needed between BASIC and ML.

A simple little routine to save a lot of time, fingers, eyes and late hours!

Stephen Miller is an electronics hobbyist who enjoys hardware-hacking on his CoCo 2 and 3. He was one of the first CoCo 3 owners in Canada.

(Questions or comments concerning this program may be directed to the author at P.O. Box 5000, Penetanguishene, Ontario, Canada L0K 1P0. Please enclose an SASE when requesting a reply.) □

The listing: ML-DATA

```
1 '*****************************
2 '*      STEPHEN MILLER       *
3 '*       P.O.BOX 5ØØØ        *
4 '* PENETANGUISHENE,  ONTARIO *
5 '* CANADA             LØK 1PØ *
6 '*****************************
1Ø CLEAR7ØØ
2Ø CLS:PRINT" THIS PROGRAM WILL
TAKE A M/L   PROGRAM IN MEMORY,
AND CREATE A BASIC 'DATA' FILE F
OR A LOADER  ROUTINE YOU CAN ADD
 INTO A BASICPROGRAM.  THE DATA
FILE WILL USELINE 'Ø',AND LINES
1ØØØØ AND UP.
3Ø INPUT"HOW MUCH STRING SPACE T
O CLEAR ";CL:PRINT"USE HEX VALUE
S AND USE '&H'":INPUT"CLEAR AT W
HAT ADDRESS ";CL$:INPUT"WHAT LIN
E NUMBER TO RETURN TO   ";LN
4Ø INPUT"enter M/L FILENAME: ";N
$:LOADMN$
5Ø PRINT:INPUT"enter START ADDRE
SS OF M/L IN   MEMORY: ";ST:PRIN
T:INPUT"enter ENDING ADDRESS OF
M/L IN  MEMORY: ";EN
6Ø Y=1ØØØ1
7Ø OPEN"O",#1,"DATAFILE.BAS"
8Ø CLS:A$="Ø CLEAR"+STR$(CL)+","
+CL$+":GOTO1ØØØØ":PRINTA$:PRINT#
1,A$:A$="1ØØØØ FORADD=&H"+HEX$(S
T)+" TO&H"+HEX$(EN)+":READINF$:P
OKEADD,VAL("+CHR$(34)+"&H"+CHR$(
34)+"+INF$):NEXT:GOTO"+STR$(LN):
PRINTA$:PRINT#1,A$
9Ø A$="DATA "
1ØØ FORT=ST TOEN:Z=Z+1:IFZ=>7ØTH
ENGOSUB13Ø
11Ø D$=HEX$(PEEK(T)):A$=A$+D$+",
":NEXT:GOSUB13Ø
12Ø CLOSE:PRINT@392,"finished: &
H"HEX$(T-1):END
13Ø A$=LEFT$(A$,LEN(A$)-1):A$=ST
R$(Y)+" "+A$:A$=RIGHT$(A$,LEN(A$
)-1):Y=Y+1
14Ø CLS:PRINT@32,A$:PRINT@392,"a
ddress: &H"HEX$(T)
15Ø PRINT#1,A$
16Ø Z=Ø:A$="DATA ":RETURN
```

Create great games and Simulations in CoCo's own language

The Little Graphics Library

By Kevin Dowd

There's nothing like the speed of machine language graphics! In this article I'll show you building blocks and a method for creating fast, high-quality assembly language games and Simulations.

Think of the screen as a stage. We will decide who the players will be, perhaps meteors and spaceships or mice in a maze. We'll decide how they should interact (i.e. what happens if a mouse encounters a spaceship). In general, however, we'll keep loose control, allowing our players to move freely within the restrictions we choose. We could even play, too. The important thing is that we are going to let the players drive the program, rather than let the program drive the players.

Kevin Dowd is a technical support analyst with Multiflow Computer, Inc. He bought his first Color Computer in 1982 and hasn't gone to bed on time since.

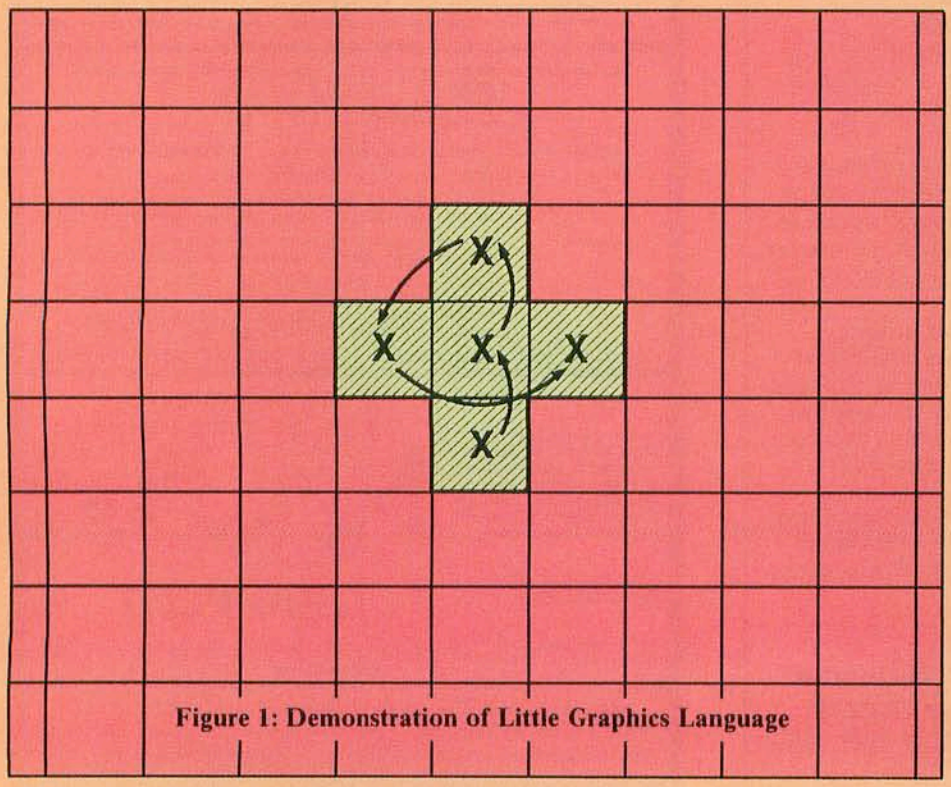


Figure 1: Demonstration of Little Graphics Language

You'll need an assembler and familiarity with the 6809 assembly language, the machine language of your Color Computer. We'll explore a number of programs and incrementally build on a library of subroutines. I will tell you about the new routines as we use them, so you needn't have them all keyed in to get started.

To write any graphics game we'll need to be able to move and monitor objects on the screen. Let's start at the very beginning with a method for drawing a picture, independent of giving it movement.

Statics

Let me introduce something I call *The Little Graphics Language* (*LGL*). Picture the screen as a piece of graph paper; imagine that you are going to draw something in a pattern of neighboring squares, one at a time. In each step you are allowed to color in the square where you are and/or move to another, vertically, horizontally or diagonally. This completely describes the procedure for programming with

LGL. The drawing in Figure 1 and the following example show how to construct a blue plus sign three pixels wide and three pixels high:

```
BLUEUP write a blue pixel, move
       cursor up
BLUEUP write a blue pixel, move
       cursor up
BLUEDL write a blue pixel, move
       down and left
BLUERT write a blue pixel, move
       right
RIGHT  move right
BLUE   write a blue pixel
DONE
```

We drew three blue pixels vertically, moved down and to the left and drew another, and then moved right two pixels and drew a final blue pixel. Be sure to note that first we draw and then we move. I will be referring to pictures we have drawn with *LGL* as "shapes."

PROG1	$6800	$6E71	$6800
PROG2	$6800	$6E9D	$6800
PROG3	$6800	$6EA8	$6800
PROG4	$6800	$71A0	$6800

Table 1: Final Start, End and Execute addresses for PROG1 through PROG4 when assembled with LIBRARY.

Having described how it's constructed, we can draw this shape on the screen; first, however, we have to choose where it will be drawn. Any screen location will suffice as long as it's between the first possible location (Pixel 0) and the last (Pixel 12287 for the graphics mode I've chosen). Pixels are numbered starting with 0 at the upper left of the screen and progressing to the right until they wrap around on the next line.

"To write any graphics game we'll need to be able to move and monitor objects on the screen."

The program shown in Listing 1 is for drawing the plus sign. It uses the subroutines VIDEO, VRAMCO, WRTSHP, NXTSET. At a minimum these routines must be included with PROG1, along with the tables listed at the end of the library (Listing 5). First, enter and save the code for Listing 5. Use the filename LIBRARY.ASM. Then type in Listing 1, and merge in LIBRARY.ASM according to your assembler, assembling the programs together. You will need to resave the binary file with the addresses shown in Table 1. Each of the listings 1 through 4 must be assembled *with* Listing 5 or parts of it, at least. You will need to leave out comments for Listing 4.

With PROG1 we make a major accomplishment: drawing our first "static" picture, following these important steps:

1) Pick a screen location and store it into SCRLOC (screen location), a variable representing the number of the pixel where the shape will be drawn.

2) Translate SCRLOC into actual video RAM coordinates with a call to VRAMCO. The CoCo allows you to reserve any part of memory for use as video RAM, the memory containing the picture on the screen. I've chosen to locate our video RAM starting at Location 29696, so whenever we talk about Screen Location 0 we are actually referring to Memory Location 29696. In fact, the first four pixels are packed into that first video RAM location.

VRAMCO generates two values called VLOC and VBIT. VLOC describes the pixel's address in RAM; since there is more than one pixel per byte, VBIT is used to describe which of the four possible pixels to use.

3) Put the address of PLSSGN into STSH (start of shape). STSH is read in the next step.

4) Call WRTSHP to draw the plus-sign on the screen. WRTSHP reads *LGL* instructions starting from the address stored in STSH until it reaches the DONE instruction.

5) Loop forever. Press the reset button to return control of your CoCo.

Dynamics

We could move the plus sign the way a cartoonist does, by repeatedly drawing it farther and farther off in one direction. But in our case we had better erase the character from its old location, lest we produce a smear. To this end, PROG1 can be modified to loop with a continously changing value of SCRLOC. To move right, add a value of one each iteration. To move up or down, add or subtract a whole line at a time — 128 pixels. Perhaps we want a continuous diagonal movement. This quantity of movement is called a "vector", one of

Subroutine Summary

VIDEO — INPUTS: none
MODIFIES: CC,A,X.
OUTPUTS: none
For setting up video parameters, erasing the screen and the C-list.

VRAMCO —INPUTS: SCRLOC
MODIFIES: CC,D
OUTPUTS: VLOC, VBIT
Translates a screen location (pixel number) into actual video RAM coordinates. SCRLOC is usually set by the programmer. The outputs, VLOC and VBIT, give the video RAM address and pixel number (0 to 3) at that address. These are never set by hand. This routine must be called before adding a character to the C-list or drawing a static shape on the screen.

WRTSHP —INPUTS: STSH, VLOC, VBIT
MODIFIES: CC,D,Y, video RAM, TLOC, TBIT
OUTPUTS: none
Draws a picture according to the *LGL* intructions at the memory address contained in STSH. The value of STSH is either set by hand or by a call to SHPADR. The placement of the shape on the screen is determined by the values in VLOC and VBIT. These are either set by VRAMCO or extracted from the C-list by GETLOC.

NXTSET —used internally. Updates the cursor position according to the *LGL* instructions.

ADDCHL —INPUTS: SHAPE, SCRLOC, AUX, VLOC, VBIT, VOUT

the qualities a "character" possesses in addition to its shape. Here's a sample vector for moving two pixels right and one pixel down:

right + right + down = 1 + 1 + 128 = 130

Byte #	Also known as	Purpose
0	XSHAPE	byte number identifying what type of character this is (i.e. mouse or spaceship?). It must be an even number.
1-2	XSCLOC	screen location where the character last moved.
3	XAUX	User-defined purpose.
4-5	XVLOC	Video RAM location corresponding to XSCLOC. It was generated by a call to VRAMCO.
6	XBIT	Pixel offset in XVLOC. Also generated by VRAMCO.
7-8	XVECT	Character's vector.

Figure 2

A character's new location can be calculated from its old location by adding the old location and the vector together.

If we set off hard-coding a loop to guide the movements of 100 characters, we'd soon find ourselves short on patience — not to mention program memory! More desirable is having some kind of method for handling a large number of characters in a uniform way. For that purpose I propose a character list, or C-list. The C-list is an area of memory we've reserved and divided into 100 little compartments, each containing information about the state of one active character. Updating the screen will be done by passing through the C-list and updating each entry. (Imagine this as a nursery with 100 cribs. The nurse looks into each in turn, skips the empty ones and attends to those with babies inside. In each of the programs we construct, we will include one "main loop" to pass through the C-list the same way the nurse checks over the cribs.)

The information stored in the C-list is necessary for tracking characters, i.e. vectors and video RAM locations. A list of the contents of each of the nine bytes of a single C-list entry is shown in Figure 2.

As a convention, any slot with a character number (XSHAPE) of zero is considered empty and can be subsequently filled in. Similarly, if we want to delete a character from the game, we simply set its C-list entry (XSHAPE) to zero.

It is very useful to have the addresses for the *LGL* routines all gathered into one area called a "shape table." That way, when we are stepping through the C-list and come across a character/shape number of 12, for example, we can quickly look in the twelfth shape table entry to find out how Character 12 is drawn. In the next program the address of the *LGL* instructions for drawing the plus sign will live in the shape table at Location 2. (See Figure 3.)

The new routines required for PROG2 are ADDCHL, SHPADR, ANTISH, NEWLOC and PUTLOC. See the subroutine summaries for more information about what these routines do and what resources they use.

In PROG2 we used the C-list even though we were keeping track of only one character. With the framework we've already built, it is simple to add more characters — in fact, it requires only three lines!

```
00412 LDD #128    Vector for
                  ''down''
00414 STD VOUT
00416 JSR ADDCHL  Add another
                  character
                  to the list.
```

The plus signs are interesting, but you may have already noticed a serious shortcoming: They are oblivious to one another. What good is a game if the players don't interact? Furthermore, they are blind to their surroundings. If we drew a brick wall on the screen, they'd pass right through it! At the very least we want them to bump into each other. We might also want them to explode or wiggle a little.

How do we detect that we have

MODIFIES: CC,D,Y and the C-list.
OUTPUTS: none
This routine is for adding a character to the C-list. It steps through, looking for the first empty slot. If there are no empty slots nothing is added. SHAPE, usually set by the programmer, identifies the character by number. SCRLOC, set by program or programmer, is the screen location where the character is to appear initially. The use and value of AUX is defined on a character-by-character basis. VLOC and VBIT are created by a call to VRAMCO. VRAMCO must be called after setting SCRLOC and before calling ADDCHL. VOUT is the vector the character will have initially. It is set by the programmer or by RNDVEC or DIRVEC.
After ADDCHL has placed these values in the C-list, they can be retrieved by referring to offsets from the X register. This table shows how the variables read by ADDCHL are associated with the C-list:

```
SHAPE  —
XSHAPE,X  shape or character
          number
SCRLOC —
XSCLOC,X  screen location or
          pixel number
AUX    —
XAUX,X    user defined
VLOC   —
XVLOC,X   video RAM location
VBIT   —
XVBIT,X   video RAM pixel
          offset
VOUT   —
XVECT,X   vector
```

SHPADR —INPUTS: A
MODIFIES: CC,Y,D
OUTPUTS: STSH
Takes the value in the A register as an offset into the shape table. The value of A must be even, and there must be a shape table entry corresponding to A. The output STSH is set to the address retrieved from the shape table. WRTSHP, ANTISH and OKMOV use STSH for drawing, erasing and checking for occurrences of other objects on the screen.

ANTISH —INPUTS: STSH, C-list values XVLOC,X and XVBIT,X
MODIFIES: CC,D,Y, video RAM, TLOC, TBIT
OUTPUTS: none
Erases a character from the screen. As a general rule, characters must always be erased before they are moved. When this routine is called, the X register must point into the C-list to the character you want to erase. STSH must have been set already with a call to SHPADR. The values XVLOC,X

bumped into something? Recall our algorithm for moving the plus signs:

1) Erase the old plus sign from screen
2) Calculate the new location for the plus sign by adding the vector to the old location
3) Write plus sign at the new location
4) Store the new location into the C-list

I propose we add some new operations between steps 2 and 3. Instead of immediately drawing the character at the new location, what if we first check the pixels where the shape is about to be written to see if anything is there already? If there is, we can skip this character and continue on to the next C-list entry. We might also want to generate a new — probably random — vector for the character, so that next time it heads in a different direction. Now we:

1) Erase the old plus sign from screen.
2) Calculate the new location for the plus sign by adding the vector to the old location.
2a) Check the new location to see if it's already occupied.
2b) If not occupied go to 3.
2c) Generate a random vector.
2d) Get the old location from the C-list.
2e) Redraw the character where it was before.
2f) Go to 5.
3) Write plus sign at the new location.
4) Store the new location into the C-list.
5) Continue stepping through C-list.

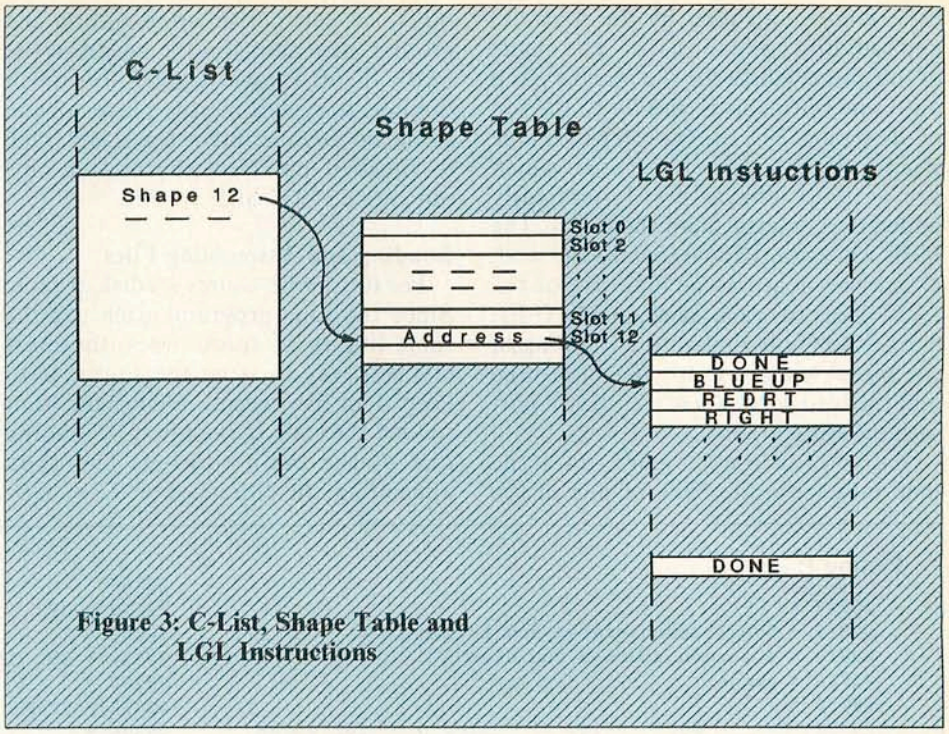


Figure 3: C-List, Shape Table and LGL Instructions

The program shown in Listing 3 illustrates these steps. It completely fills the C-list with swirling little white dots. The new routines we'll be using are OKMOV, RNDVEC and GETLOC.

Here are some interesting variations to PROG3:

1) Put up obstructions. First define a barrier shape with *LGL* instructions (maybe bricks?), and place them about the screen the same way we drew the "static" plus sign in PROG1.

2) Fill the C-list with an assortment of objects. (Notice that if the shapes are too complex, they'll slow down the program, in which case you might want to half-fill the C-list.)

3) Multiply some of the vectors by two. (Shift the D register to the left.)

The next program makes full use of the subroutine library. First we'll draw a mountain range. Then we'll place one

and XVBIT,X are automatically retrieved.

NEWLOC —INPUTS: C-list values XSCLOC,X and XVECT,X
MODIFIES: CC,D
OUTPUTS: VLOC, VBIT, SCRLOC
Calculates new screen location and video RAM address for the C-list character currently pointed to by the X register by adding the character's vector to its old location.

PUTLOC —INPUTS: VLOC, VBIT, SCRLOC
MODIFIES: CC,D
OUTPUTS: C-list values XVLOC,X, XVBIT,X, XSCLOC,X
Stores screen location and video RAM address values into C-list entry pointed to X register. Usually done to update C-list after calling NEWLOC and successfully moving a character.

OKMOV — INPUTS: STSH, VLOC, VBIT
MODIFIES: CC,D,Y, TBIT, TLOC
OUTPUTS: the Z flag in the condition code.
Traces out the *LGL* shape instructions whose address appears in STSH at the location given by VLOC and VBIT. If no pixels are found to be set (i.e. there is nothing there already) the Z flag is set, otherwise cleared. (If the Z flag is set, tests for zero will be true; for instance, a Branch On Equal (BEQ) instruction will branch.)

RNDVEC —INPUTS: none
MODIFIES: CC,D, RND1, TVEC
OUTPUTS: VOUT
Generates a random vector with a maximum displacement of one pixel in any direction.

GETLOC —INPUTS: none
MODIFIES: CC,D
OUTPUTS: VBIT, VLOC
Retrieves video RAM address where a character is drawn from the C-list. Usually called just after OKMOV has failed and before WRTSHP is called to restore the character to the screen.

BSTATE —INPUTS: none
MODIFIES: CC,A
OUTPUTS: BUTTON
Checks to see if the fire button is pushed. Sets BUTTON if it is, clears it otherwise.

DIRVEC —INPUTS: TARGET, C-list XSCLOC,X
MODIFIES: CC,D, TVEC
OUTPUTS: VOUT
Generates a vector toward the screen location that has been previously stored in TARGET. This is the routine used to guide the birds to the birdseed.

little man (controlled by the joystick) and four birds into the C-list. The object of the game will be for the man to jump onto one of the birds and fly to the top of the screen. The fire button will enable you to throw grains of bird seed, which are actually characters dynamically added and deleted from the C-list. The birds will swoop down toward the seed. Other new features include use of the XAUX byte of each character's C-list entry. XAUX will control the flapping of the birds' wings. As for the little man and the bird seed, XAUX will play a part in simulating gravity.

Yes, you can lose this game too! If the man falls from the back of one of the birds, he can perish upon hitting the ground, depending on the height of the bird's flight. I haven't given too much thought to rewarding the player of the game, so anyone interested is welcome to finish it up. New subroutines this time are BSTATE and DIRVEC.

Loading and Assembling Files

For those with source on disk or tape: Since the four programs each use the same library of subroutines, the most efficient way to store the source is to keep it in five pieces. When you want to load the source, start first by loading one of the main routines and then appending the library. For *Disk EDTASM* users this is done with the LOA command. For those using the *EDTASM+* ROM pack, two loads with the L command will append files automatically.

Disk EDTASM users will find that the first three programs can be assembled in memory with the /AO/IM switches if EDTASMOV is used. The fourth must be assembled to disk. ROM pack users can assemble any of the four programs directly in memory.

(Questions or comments concerning this tutorial may be directed to the author at 84 Round Hill Road, Wethersfield, CT 06109. Please enclose an SASE when requesting a reply.) □

Listing 1: PROG1

```
0001 *
0002 * Prog1 demonstrates how to choose
0004 * a screen address and draw a
0006 * shape.
0008 *
0010 DPVAL   EQU     $67     Using D.P. for speed
0011 STACK   EQU     DPVAL*256-1
0012         SETDP   DPVAL
0013         ORG     DPVAL*256+256
0014 START   LDA     #DPVAL
0015         TFR     A,DP    Set D.P. register
0016         LDS     #STACK  Move stack
0017         JSR     VIDEO   Init vid params
0018 *
0019 * CHOSE WHERE TO DRAW
0020 *
0021         LDD     #6200   Center of screen
0022         STD     SCRLOC  Store for VRAMCO
0023         JSR     VRAMCO  Create ram addr
0024         LDD     #PLSSGN Get addr of +
0025         STD     STSH    Store for WRTSHP
0026         JSR     WRTSHP  Write the shape
0027 LOOP    BRA     LOOP    busy loop
0028 *
0029 * END OF MAN PROGRAM
0030 *
0032 * START OF SHAPE TABLE
0034 *
0036 SHTBL   FDB     0
0038 *
0031 * START OF SHAPE DEFS
0032 *
0033 PLSSGN  FCB     BLUEUP
0034         FCB     BLUEUP
0035         FCB     BLUEDL
0036         FCB     BLUERT
0037         FCB     RIGHT
0038         FCB     BLUE
0039         FCB     DONE
0040 *
0041 * END OF CUSTOM CODE.
0042 * THE REST OF THIS STAYS
0043 * THE SAME.
```

Listing 2: PROG2

```
0100 *
0110 * Prog2 demonstrates animation
0120 * and use of the c-list for tracking
0130 * animated characters.
0140 *
0150 DPVAL   EQU     $67
0160 STACK   EQU     DPVAL*256-1
0170         SETDP   DPVAL
0180         ORG     DPVAL*256+256
0190 START   LDA     #DPVAL
0200         TFR     A,DP
0210         LDS     #STACK
0220         JSR     VIDEO
0230 *
0240 * Going to add just one character
0250 * to the c-list. First set up params
0260 * for call to ADDCHL.
0270 *
0280         LDD     #6200   Center of screen
0290         STD     SCRLOC  Store for VRAMCO
0300         JSR     VRAMCO  generate ram adr
0310         LDA     #PLUS   character # for +
0320         STA     SHAPE   store for addchl
0330 *
0340 * the value "130" is the vector we
0350 * chose to make the character move
0360 * right 2 pixels and down one in
0370 * each pass through the c-list.
0380 *
0390         LDD     #130
0400         STD     VOUT    Vector for addchl
0410         JSR     ADDCHL  Add to c-list
0420 *
0430 LOOP    LDX     #IXSTRT Point to c-list
0440 CONT1   LEAX    XNEXT,X Pt. next slot
0450         CMPX    #CLEND  End of clist?
0460         BHS     LOOP
0470 *
0480 * Stepping through c-list now.
0482 * We KNOW that there is only 1
0484 * entry being used in the c-list
0486 * but I wanted to show you how to
0488 * set up the loop anyway.
0490 * Get character's shape number.
0500 *
0510         LDA     XSHAPE,X
0520         BEQ     CONT1   Skip empties
0530         CMPA    #PLUS
0540         BNE     CONT1   Skip if not +
0550 *
0560         JSR     SHPADR  Get +'s shape
0570         JSR     ANTISH  Erase +
0580         JSR     NEWLOC  Add vctr to loc
0590         JSR     WRTSHP  Draw at new loc.
0600         JSR     PUTLOC  Put in c-list
0610         BRA     CONT1
0620 *
```

```
00630 * END OF MAN PROGRAM
00640 *
00650 * START OF SHAPE TABLE
00652 * Note how the shape number for
00654 * "plus" has been symbolicly
00656 * defined.
00660 *
00670 SHTBL   FDB     0
00680 PLUS    EQU     *-SHTBL
00690         FDB     PLSSGN
00700 *
00710 * START OF SHAPE DEFS
00720 *
00730 PLSSGN  FCB     BLUEUP
00740         FCB     BLUEUP
00750         FCB     BLUEDL
00760         FCB     BLUERT
00770         FCB     RIGHT
00780         FCB     BLUE
00790         FCB     DONE
00800 *
00810 * END OF CUSTOM CODE.
00820 * THE REST OF THIS STAYS
00830 * THE SAME.
```

Listing 3: PROG3

```
00100 *
00110 * Prog3 demonstrates how to make
00120 * objects on the screen interact
00130 * with one another.
00150 *
00160 DPVAL   EQU     $67
00170 STACK   EQU     DPVAL*256-1
00180         SETDP   DPVAL
00190         ORG     DPVAL*256+256
00200 START   LDA     #DPVAL
00210         TFR     A,DP
00220         LDS     #STACK
00230         JSR     VIDEO
00240         LDA     #DOT    Dot's shape #
00250         STA     SHAPE   For ADDCHL
00260 LOOP1   LDD     #6200   Screen center
00270         STD     SCRLOC  For VRAMCO
00280         JSR     VRAMCO  Gen ram loc
00290         JSR     RNDVEC  Random vectr
00300         JSR     ADDCHL  add to c-list
00310 *
00320 * Note we are continually trying
00330 * to add new characters to the
00340 * c-list even though it'll be
00350 * stuffed full after the 1st 100.
00360 *
00370 CONT1   LDX     #IXSTRT pt to c-list
00380 LOOP2   LEAX    XNEXT,X pt next slot
00390         CMPX    #CLEND  end of clist?
00400         BHS     LOOP1
00410 *
00420 * Step through c-list
00430 *
00440         LDA     XSHAPE,X
00450         BEQ     LOOP2   Skip empties
00460 *
00470 * All characters will be handled the
00480 * same. You could fill the c-list with
00490 * any combination of dots, dashes,
00492 * or whatever...
00494 *
00500         JSR     SHPADR
00510         JSR     ANTISH  erase char
00520         JSR     NEWLOC  Gen new loc
00530         JSR     OKMOV   Ok to move?
00540         BEQ     ITSOK
00550 *
00560 * If something is already at the
00570 * place on the screen where we
00580 * want to go then pick a new
00590 * vector for next time and give up.
00600 *
00610         JSR     RNDVEC  random vctr
00620         LDD     VOUT    get result
00630         STD     XVECT,X put in c-list
00640         JSR     GETLOC  get old loc
00650         JSR     WRTSHP  redraw there
00660         BRA     LOOP2   Go do next
00670 *
00680 * If it was ok to move to the new
00690 * location then do it.
00700 *
00710 ITSOK   JSR     WRTSHP  Draw at new
00720         JSR     PUTLOC  update c-list
00730         BRA     LOOP2
00740 *
00750 * END OF MAIN PROGRAM
00760 *
00770 * START OF SHAPE TABLE
00780 *
00790 SHTBL   FDB     0
00800 DOT     EQU     *-SHTBL
00810         FDB     WHTDOT
00820 *
00830 * START OF SHAPE DEFS
00840 *
00850 WHTDOT  FCB     WHITE
00860         FCB     DONE
00870 *
00880 * END OF CUSTOM CODE.
00890 * THE REST OF THIS STAYS
00900 * THE SAME.
```

Listing 4: PROG4

```
00100 *
00110 * Prog4 demostrates full use of
00120 * the subroutine library.
00130 * The object of the game is to fly
00140 * to the top of the screen on the
00150 * back of one of the birds. If
00160 * you fall you may die. The joystick
00170 * fire button will cause you to
00180 * throw bird seed. This attracts
00190 * the birds so you can jump on
00200 * them.
00210 * - Kevin Dowd
00220 DPVAL   EQU     $67
00230 STACK   EQU     DPVAL*256-1
00240         SETDP   DPVAL
00250         ORG     DPVAL*256+256
00260 START   LDA     #DPVAL
00270         TFR     A,DP
00280         LDS     #STACK
00290         JSR     VIDEO
00300 *
00310 * A mountain range will be created
00320 * by repeatedly drawing the shape
00330 * "MOUNTN" at the locations in the
00340 * list "MTLIST".
00350 *
00360         LDD     #MOUNTN
00370         STD     STSH
00380         LDX     #MTLIST
```

```
00390 LOOP1   LDD     ,X++
00400         BLT     CONT1
00410         STD     SCRLOC
00420         JSR     VRAMCO
00430         JSR     WRTSHP
00440         BRA     LOOP1
00450 *
00460 * Now we will add the players to
00470 * the c-list, 1 man and 4 birds.
00480 *
00490 CONT1   LDD     #6300
00500         STD     SCRLOC
00510         JSR     VRAMCO
00520 * ADD MAN
00530         CLR     AUX
00540         LDA     #MAN
00550         STA     SHAPE
00560         CLR     VOUT
00570         CLR     VOU2
00580         CLR     TMP3
00590         JSR     ADDCHL
00600 * ADD BIRDS
00610         LDA     #BIRD
00620         STA     SHAPE
00630         LDD     #6300
00640         STD     SCRLOC
00650         JSR     VRAMCO
00660         JSR     RNDVEC
00670         LDA     #04
00680         STA     AUX
00690         STA     TMP2
00700 LOOP3   DEC     TMP2
00710         BLT     LOOP2
00720         JSR     ADDCHL
00730         BRA     LOOP3
00740 *
00750 * This is the start of the main
00760 * loop. We'll check the joystick
00770 * and fire buttons. From the joy-
00780 * stic we'll make up a vector for
00790 * the little man to run along
00800 * the mountains.
00810 *
00820 LOOP2   JSR     [$A00A] chk joystk
00830         JSR     BSTATE  chk button
00840         LDX     #IXSTRT pt c-list
00850         TST     BUTTON  button set?
00860         BEQ     CONT2
00870 * If button was pushed will add
00880 * a grain of bird seed to the
00890 * clist.
00900 *
00910         LDA     #SEED
00920         STA     SHAPE
00930 *
00940 * The vector for the bird seed will
00950 * come from RNDVEC. Then we'll add
00960 * an upward displacement so
00970 * it'll be as if the man threw it
00980 * over his head.
00990 *
01000         JSR     RNDVEC
01010         LDD     VOUT
01020         ADDD    #$FF80
01030         STD     VOUT
01040 *
01050 * CH1LOC is a kludge. It's the
01060 * address of the screen loc of the
01070 * first character in the c-list
01080 * (in this case, the little man).
01090 * Bird seed will start just
01100 * above the man's head.
01110 *
01120         LDD     CH1LOC
01130         ADDD    #$FF80
01140         STD     SCRLOC
01150         JSR     VRAMCO
01160         CLR     AUX
01170         JSR     ADDCHL  add seed
01180 CONT2   LEAX    XNEXT,X
01190         CMPX    #CLEND  end c-list?
01200         BHS     LOOP2
01210         LDA     XSHAPE,X
01220         BEQ     CONT2   skip empties
01230         CMPA    #MAN
01240         LBGT    CONT3
01250 *
01260 * The man is constantly running.
01270 * This is a function of the
01280 * value in tmp3.
01290 * The old and new shape number
01300 * being used to draw the man is
01310 * calculate from it.
01320 *
01330         LDA     TMP3
01340         ANDA    #01
01350         LSLA
01360         ADDA    XSHAPE,X
01370         JSR     SHPADR
01380         JSR     ANTISH
01390 *
01400 * Man erased, get joystk.
01410 * Will generate a vector for the
01420 * man based on the pot values.
01430 *
01440         CLR     VOUT
01450         CLR     VOU2
01460         LDA     $15B
01470         CMPA    #$0C
01480         BGT     J01
01490         LDD     #$FF80
01500         STD     VOUT
01510         BRA     J02
01520 J01     CMPA    #33
01530         BLT     J02
01540         LDD     #$80
01550         STD     VOUT
01560 J02     LDA     $15A
01570         CMPA    #$0C
01580         BGT     J03
01590         LDD     VOUT
01600         SUBD    #01
01610         STD     VOUT
01620         BRA     J04
01630 J03     CMPA    #33
01640         BLT     J04
01650         LDD     VOUT
01660         ADDD    #01
01670         STD     VOUT
01680 *
01690 * Next will use okmov to test to
01700 * see if the man could fall.
01710 * If he can will increase the
01720 * value in X,AUX, a counter to
01730 * tell how long his feet have
01731 * been off the ground. From this
01732 * we'll generate a number by
01733 * which we can bias his vector
01734 * and simulate gravity.
01735 *
01750 J04     LDD     #$80
01760         STD     XVECT,X
01770         JSR     NEWLOC
01780         JSR     OKMOV   Can he fall?
01790         BEQ     CONT4
01800 *
01810 * Man can fall,  so he will.
01820 *
01830         CLR     XAUX,X
01840         CLRA
01850         CLRB
01851 *
```

```
01852 * GRVVEC will generate a gravity
01853 * vector based on the value of
01854 * X,AUX. If the man had his feet
01855 * on something then we have just
01856 * reset X,AUX and GRVVEC will
01857 * return a gravity bias of 0.
01858 *
01860 CONT4   JSR     GRVVEC
01870           ADDD    VOUT
01880           STD     XVECT,X
01890           JSR     NEWLOC
01900           JSR     OKMOV
01910           BEQ     CONT6
01920 *
01930 * Killed by a fall? If the man
01931 * had been able to move then
01932 * we wouldn't be here.
01933 *
01950           LDA     XAUX,X
01960           CMPA    #25
01970           LBGT    YOUDIE
01980 *
01990 * It could that he wasn't fall-
01991 * all that long, so we'll just
01992 * make him bounce a little by
01993 * generating a new vector for
01994 * him.
02000 *
02010           LDD     #0
02020           STD     GRAVTY
02030           CLR     XAUX,X
02040           JSR     RNDVEC
02050           LDD     VOUT
02060           STD     XVECT,X
02070           JSR     NEWLOC
02080           JSR     OKMOV
02090           BEQ     CONT6
02100 *
02110 * Give up if couldn't move him.
02120 *
02130           JSR     GETLOC
02140           JSR     WRTSHP
02150           LBRA    CONT2
02160 *
02161 * We were able to move the little
02162 * man by some path. Check his
02163 * screen location to see if we
02164 * won the game yet.
02165 *
02170 CONT6   LDD     SCRLOC
02180           CMPD    #$280
02190           LBLE    YOUWIN
02200 *
02210           INC     TMP3
02220           LDA     TMP3
02230           ANDA    #01
02240           LSLA
02250           ADDA    XSHAPE,X
02260           JSR     SHPADR
02270           JSR     WRTSHP
02280           JSR     PUTLOC
02281 *
02282 * Now for the birds.
02283 *
02290 CONT3   CMPA    #BIRD
02300           LBNE    CONT8
02301 *
02302 * The birds flap their wings
02303 * based on the value of X,AUX.
02304 *
02340           LDA     XAUX,X
02350           ANDA    #02
02360           ADDA    XSHAPE,X
02370           JSR     SHPADR
02380           JSR     ANTISH
02390           LDA     XAUX,X
02400           BEQ     BD4
02410           DECA
02420           ANDA    #02
02430 BD4       ADDA    XSHAPE,X
02440           JSR     SHPADR
02450           TST     BUTTON  Pushed?
02460           BEQ     BD1
02461 *
02462 * If the fire button was pushed
02463 * then the bird will head for
02464 * the last grain of bird seed
02465 * thrown. DIRVEC generates a
02466 * vector towards the screen loc
02467 * stored in TARGET.
02468 *
02470           JSR     DIRVEC
02480           LDD     VOUT
02490           STD     XVECT,X
02500 BD1       JSR     NEWLOC
02510           JSR     OKMOV
02520           BEQ     BD2
02521 *
02522 * If the bird bumps into some-
02523 * thing we'll not only generate
02524 * a new vector for it, we'll
02525 * also modify X,AUX so the wings
02526 * flap for a while.
02527 *
02530           JSR     RNDVEC
02540           LDD     VOUT
02550           STD     XVECT,X
02560           JSR     NEWLOC
02570           JSR     OKMOV
02580           BEQ     BD3
02590           JSR     GETLOC
02600           LDA     XAUX,X
02610           ANDA    #02
02620           ADDA    XSHAPE,X
02630           JSR     SHPADR
02640           JSR     WRTSHP
02650           LBRA    CONT2
02660 BD3       LDA     XAUX,X
02670           BEQ     BD5
02680           ORA     #32
02690           STA     XAUX,X  Flap
02700           BRA     BD2
02710 BD5       LDA     #33
02720           STA     XAUX,X
02730 BD2       JSR     WRTSHP
02740           JSR     PUTLOC
02750           LDA     XAUX,X
02760           LBEQ    CONT2
02770           DEC     XAUX,X
02780           LBRA    CONT2
02790 *
02800 * Bird seed
02810 *
02820 CONT8   CMPA    #SEED
02830           LBNE    CONT2
02840           LDA     XAUX,X
02850           ANDA    #01
02860           LSLA
02870           ADDA    XSHAPE,X
02880           JSR     SHPADR
02890           JSR     ANTISH
02891 * bird seed is also subject to
02892 * gravity. Whenever a grain of
02893 * bird seed bumps into something
02894 * it will be deleted from the
02895 * c-list
02896 *
02900           LDD     XVECT,X
02910           PSHS    D
02920           JSR     GRVVEC
02930           ADDD    XVECT,X
02940           STD     XVECT,X
```

```
0295Ø          LDA     XAUX,X
0296Ø          ANDA    #Ø1
0297Ø          LSLA
0298Ø          ADDA    XSHAPE,X
0299Ø          JSR     SHPADR
Ø3ØØØ          JSR     NEWLOC
Ø3Ø1Ø          JSR     OKMOV
Ø3Ø2Ø          BEQ     SD1
Ø3Ø3Ø          PULS    D
Ø3Ø4Ø          CLR     XSHAPE,X
Ø3Ø5Ø          LBRA    CONT2
Ø3Ø6Ø SD1       JSR     WRTSHP
Ø3Ø7Ø           JSR     PUTLOC
Ø3Ø8Ø           PULS    D
Ø3Ø9Ø           STD     XVECT,X
Ø31ØØ           LDD     XSCLOC,X
Ø311Ø           STD     TARGET
Ø312Ø           LBRA    CONT2
Ø313Ø YOUDIE    NOP
Ø314Ø YOUWIN    JSR     BSTATE
Ø315Ø           LDA     #2ØØ
Ø316Ø           STA     65314
Ø317Ø           TST     BUTTON
Ø318Ø           BEQ     YOUWIN
Ø319Ø           LBRA    START
Ø3191 *
Ø3192 * GRRVEC is a helper function
Ø3193 * for this program only. It
Ø3194 * generates a number based on
Ø3195 * X,AUX which, when added to a
Ø3196 * character's vector will sim-
Ø3197 * ulate gravity.
Ø3198 *
Ø32ØØ GRVVEC   LDA     XAUX,X
Ø321Ø          CMPA    #1ØØ
Ø322Ø          BGT     GØ3
Ø323Ø          INC     XAUX,X
Ø324Ø          CMPA    #Ø3
Ø325Ø          BGT     GØ1
Ø326Ø          LDD     #Ø
Ø327Ø          BRA     GØ4
Ø328Ø GØ1      CMPA    #Ø5
Ø329Ø          BGT     GØ2
Ø33ØØ          LDD     #$8Ø
Ø331Ø          BRA     GØ4
Ø332Ø GØ2      CMPA    #Ø7
Ø333Ø          BGT     GØ3
Ø334Ø          LDD     #$1ØØ
Ø335Ø          BRA     GØ4
Ø336Ø GØ3      LDD     #$18Ø
Ø337Ø GØ4      RTS
Ø338Ø *
Ø339Ø * END OF MAIN PROGRAM
Ø34ØØ *
Ø341Ø * START OF SHAPE TABLE
Ø342Ø *
Ø343Ø SHTBL    FDB     Ø
Ø344Ø MAN      EQU     *-SHTBL
Ø345Ø          FDB     MAN1
Ø346Ø          FDB     MAN2
Ø347Ø BIRD     EQU     *-SHTBL
Ø348Ø          FDB     BIRD2
Ø349Ø          FDB     BIRD1
Ø35ØØ SEED     EQU     *-SHTBL
Ø351Ø          FDB     SEED1
Ø352Ø          FDB     SEED2
Ø353Ø *
Ø354Ø * START OF SHAPE DEFS
Ø355Ø *
Ø356Ø MOUNTN   FCB     WHTRT
Ø357Ø          FCB     BLUERT
Ø358Ø          FCB     BLUERT
Ø359Ø          FCB     BLUERT
Ø36ØØ          FCB     BLUERT
Ø361Ø          FCB     BLUERT
Ø362Ø          FCB     BLUERT
Ø363Ø          FCB     BLUERT
Ø364Ø          FCB     BLUERT
Ø365Ø          FCB     BLUERT
Ø366Ø          FCB     BLUERT
Ø367Ø          FCB     BLUERT
Ø368Ø          FCB     BLUERT
Ø369Ø          FCB     BLUERT
Ø37ØØ          FCB     WHTUL
Ø371Ø          FCB     WHTLF
Ø372Ø          FCB     BLUELF
Ø373Ø          FCB     BLUELF
Ø374Ø          FCB     BLUELF
Ø375Ø          FCB     BLUELF
Ø376Ø          FCB     BLUELF
Ø377Ø          FCB     BLUELF
Ø378Ø          FCB     BLUELF
Ø379Ø          FCB     BLUELF
Ø38ØØ          FCB     BLUELF
Ø381Ø          FCB     BLUELF
Ø382Ø          FCB     BLUELF
Ø383Ø          FCB     WHTUR
Ø384Ø          FCB     WHTRT
Ø385Ø          FCB     BLUERT
Ø386Ø          FCB     BLUERT
Ø387Ø          FCB     BLUERT
Ø388Ø          FCB     BLUERT
Ø389Ø          FCB     BLUERT
Ø39ØØ          FCB     BLUERT
Ø391Ø          FCB     BLUERT
Ø392Ø          FCB     BLUERT
Ø393Ø          FCB     BLUERT
Ø394Ø          FCB     WHTUL
Ø395Ø          FCB     WHTLF
Ø396Ø          FCB     BLUELF
Ø397Ø          FCB     BLUELF
Ø398Ø          FCB     BLUELF
Ø399Ø          FCB     BLUELF
Ø4ØØØ          FCB     BLUELF
Ø4Ø1Ø          FCB     BLUELF
Ø4Ø2Ø          FCB     BLUELF
Ø4Ø3Ø          FCB     WHTUR
Ø4Ø4Ø          FCB     WHTRT
Ø4Ø5Ø          FCB     BLUERT
Ø4Ø6Ø          FCB     BLUERT
Ø4Ø7Ø          FCB     BLUERT
Ø4Ø8Ø          FCB     BLUERT
Ø4Ø9Ø          FCB     BLUERT
Ø41ØØ          FCB     WHTUL
Ø411Ø          FCB     WHTLF
Ø412Ø          FCB     BLUELF
Ø413Ø          FCB     BLUELF
Ø414Ø          FCB     BLUELF
Ø415Ø          FCB     WHTUR
Ø416Ø          FCB     WHTRT
Ø417Ø          FCB     BLUERT
Ø418Ø          FCB     WHTUL
Ø419Ø          FCB     WHITE
Ø42ØØ          FCB     DONE
Ø421Ø *
Ø4211 * This is a list of screen
Ø4212 * locations where mountains
Ø4213 * are drawn.
Ø4214 *
Ø422Ø MTLIST   FDB     1218Ø
Ø423Ø          FDB     11164
Ø424Ø          FDB     11672
Ø425Ø          FDB     12188
Ø426Ø          FDB     11676
Ø427Ø          FDB     118Ø9
Ø428Ø          FDB     12199
Ø429Ø          FDB     1221Ø
Ø43ØØ          FDB     11194
Ø431Ø          FDB     117Ø2
Ø432Ø          FDB     12218
Ø433Ø          FDB     117Ø6
Ø434Ø          FDB     1184Ø
Ø435Ø          FDB     12227
Ø436Ø          FDB     12236
Ø437Ø          FDB     12242
Ø438Ø          FDB     11861
Ø439Ø          FDB     12248
Ø44ØØ          FDB     12253
Ø441Ø          FDB     12257
Ø442Ø          FDB     1175Ø
Ø443Ø          FDB     12265
Ø444Ø          FDB     12276
Ø445Ø          FDB     1Ø559
Ø446Ø          FDB     1Ø946
Ø447Ø          FDB     11462
Ø448Ø          FDB     12176
Ø449Ø          FDB     12166
Ø45ØØ          FDB     11779
Ø451Ø          FDB     1216Ø
Ø452Ø          FDB     $FFFF
Ø453Ø MAN1     FCB     WHTDN
Ø454Ø          FCB     BLUELF
Ø455Ø          FCB     REDDR
Ø456Ø          FCB     BLUEDL
Ø457Ø          FCB     REDRT
Ø458Ø          FCB     BLKRT
Ø459Ø          FCB     REDUP
Ø46ØØ          FCB     UP
Ø461Ø          FCB     RED
Ø462Ø          FCB     DONE
Ø463Ø MAN2     FCB     WHTDN
Ø464Ø          FCB     BLUELF
Ø465Ø          FCB     BLKDR
Ø466Ø          FCB     REDDL
Ø467Ø          FCB     BLKRT
Ø468Ø          FCB     REDRT
Ø469Ø          FCB     BLKUP
Ø47ØØ          FCB     UP
Ø471Ø          FCB     BLACK
Ø472Ø          FCB     DONE
Ø473Ø BIRD1    FCB     WHTUL
Ø474Ø          FCB     LEFT
Ø475Ø          FCB     LEFT
Ø476Ø          FCB     LEFT
Ø477Ø          FCB     WHTDR
Ø478Ø          FCB     WHTDR
Ø479Ø          FCB     REDRT
Ø48ØØ          FCB     REDRT
Ø481Ø          FCB     RIGHT
Ø482Ø          FCB     REDRT
Ø483Ø          FCB     REDUR
Ø484Ø          FCB     WHTUR
Ø485Ø          FCB     WHITE
Ø486Ø          FCB     DONE
Ø487Ø BIRD2    FCB     WHTDL
Ø488Ø          FCB     LEFT
Ø489Ø          FCB     LEFT
Ø49ØØ          FCB     LEFT
Ø491Ø          FCB     WHTRT
Ø492Ø          FCB     WHTRT
Ø493Ø          FCB     REDRT
Ø494Ø          FCB     REDRT
Ø495Ø          FCB     RIGHT
Ø496Ø          FCB     REDRT
Ø497Ø          FCB     REDRT
Ø498Ø          FCB     WHTRT
Ø499Ø          FCB     WHTRT
Ø5ØØØ          FCB     DONE
Ø5Ø1Ø SEED1    FCB     RED
Ø5Ø2Ø          FCB     DONE
Ø5Ø3Ø SEED2    FCB     BLUE
Ø5Ø4Ø          FCB     DONE
Ø5Ø5Ø * END OF CUSTOM CODE
Ø5Ø6Ø * THE REST OF THIS STAYS
Ø5Ø7Ø * THE SAME.
```

Listing 5:

```
06000 VIDEO   EQU     *
06010 *
06020 * THIS ROUTINE HAS REALLY
06030 * HARD PARAMETRS.
06040 *
06050 SCREEN  EQU     29696
06060 SCREND  EQU     32767
06070         STA     65478
06080         STA     65481
06090         STA     65482
06100         STA     65485
06110         STA     65487
06120         STA     65489
06130         STA     65472
06140         STA     65474
06150         STA     65477
06160         LDA     #255
06170         STA     65314
06180 * CLEAR SREEN AND CLIST
06190         LDX     #SCREEN
06200 XX1     CMPX    #SCREND
06210         BHI     XX2
06220         CLR     ,X+
06230         BRA     XX1
06240 XX2     LDX     #CLIST
06250 XX3     CMPX    #CLEND
06260         BGT     XX4
06270         CLR     ,X+
06280         BRA     XX3
06290 XX4     RTS
06300 ADDCHL  LDY     #IXSTRT
06310 C90     LEAY    XNEXT,Y
06320         CMPY    #CLEND
06330         BGE     C91
06340         TST     XSHAPE,Y
06350         BNE     C90
06360         LDA     SHAPE
06370         STA     XSHAPE,Y
06380         LDD     SCRLOC
06390         STD     XSCLOC,Y
06400         LDA     AUX
06410         STA     XAUX,Y
06420         LDD     VLOC
06430         STD     XVLOC,Y
06440         LDA     VBIT
06450         STA     XVBIT,Y
06460         LDD     VOUT
06470         STD     XVECT,Y
06480 C91     RTS
06490 *
06500 GETLOC  LDA     XVBIT,X
06510         STA     VBIT
06520         LDD     XVLOC,X
06530         STD     VLOC
06540         RTS
06550 PUTLOC  LDA     VBIT
06560         STA     XVBIT,X
06570         LDD     VLOC
06580         STD     XVLOC,X
06590         LDD     SCRLOC
06600         STD     XSCLOC,X
06610         RTS
06620 VRAMCO  LDB     SCRLO2
06630         ANDB    #03
06640         STB     VBIT
06650         LDD     SCRLOC
06660         LSRB
06670         LSRA
06680         BCC     CC1
06690         ADDB    #$80
06700 CC1     LSRB
06710         LSRA
06720         BCC     CC2
06730         ADDB    #$80
06740 CC2     ADDD    #SCREEN
06750         STD     VLOC
06760         RTS
06770 *
06780 NXTSET  LDA     #$20
06790         ANDA    ,Y
06800         BEQ     C07
06810         DEC     TBIT
06820         BGE     C10
06830         LDA     #03
06840         STA     TBIT
06850         LDD     TLOC
06860         SUBD    #01
06870         STD     TLOC
06880         BRA     C10
06890 C07     LDA     #$10
06900         ANDA    ,Y
06910         BEQ     C10
06920         INC     TBIT
06930         LDA     #04
06940         ANDA    TBIT
06950         BEQ     C10
06960         CLR     TBIT
06970         LDD     TLOC
06980         ADDD    #01
06990         STD     TLOC
07000 C10     LDA     #$08
07010         ANDA    ,Y
07020         BEQ     C11
07030         LDD     TLOC
07040         SUBD    #32
07050         CMPD    #SCREEN
07060         BGE     C14
07070         ADDD    #3072
07080         BRA     C14
07090 C11     LDA     #$04
07100         ANDA    ,Y
07110         BEQ     C09
07120         LDD     TLOC
07130         ADDD    #32
07140         CMPD    #SCREND
07150         BLE     C14
07160         SUBD    #3072
07170 C14     STD     TLOC
07180 C09     LEAY    1,Y
07190         RTS
07200 *
07210 NEWLOC  LDD     XSCLOC,X
07220         ADDD    XVECT,X
07230         BGE     C15
07240         ADDD    #12288
07250         BRA     C16
07260 C15     CMPD    #12287
07270         BLE     C16
07280         SUBD    #12288
07290 C16     STD     SCRLOC
07300         JSR     VRAMCO
07310         RTS
07320 *
07330 WRTSHP  LDD     VLOC
07340         STD     TLOC
07350         LDA     VBIT
07360         STA     TBIT
07370         LDY     STSH
07380 C22     LDA     ,Y
07390         BGE     C23
07400         RTS
07410 C23     TFR     A,B
07420         ANDA    #$40
07430         BEQ     C24
07440         ANDB    #03
07450         LDA     #03
07460         SUBA    TBIT
07470         STA     TMP2
```

```
0748          LDA     #03
0749 C300     TST     TMP2
0750          BEQ     C301
0751 C302     LSLA
0752          LSLA
0753          LSLB
0754          LSLB
0755          DEC     TMP2
0756          BNE     C302
0757 C301     COMA
0758          ANDA    [TLOC]
0759          STA     [TLOC]
0760          ORB     [TLOC]
0761          STB     [TLOC]
0762 C24      JSR     NXTSET
0763          BRA     C22
0764 *
0765 SHPADR   TFR     A,B
0766          CLRA
0767          ADDD    #SHTBL
0768          TFR     D,Y
0769          LDD     ,Y
0770          STD     STSH
0771          RTS
0772 *
0773 RNDVEC   LDA     RND1
0774          LDB     #243
0775          MUL
0776          ADDD    #01
0777          ADDD    SCRLOC
0778          STB     TVEC
0779          STB     RND1
0780          TFR     B,A
0781          CLR     VOUT
0782          CLR     VOU2
0783          ANDA    #01
0784          BEQ     V01
0785          LDD     #$FF80
0786          STD     VOUT
0787          BRA     V02
0788 V01      LDA     TVEC
0789          ANDA    #02
0790          BEQ     V02
0791          LDD     #128
0792          STD     VOUT
0793 V02      LDA     TVEC
0794          ANDA    #04
0795          BEQ     V03
0796          LDD     VOUT
0797          SUBD    #01
0798          STD     VOUT
0799          BRA     V04
0800 V03      LDA     TVEC
0801          ANDA    #$08
0802          BEQ     V04
0803          LDD     VOUT
0804          ADDD    #01
0805          STD     VOUT
0806 V04      LDD     VOUT
0807          BEQ     RNDVEC
0808          RTS
0809 DIRVEC   LDD     XSCLOC,X
0810          ANDB    #$80
0811          STD     TVEC
0812          LDD     TARGET
0813          ANDB    #$80
0814          SUBD    TVEC
0815          CMPD    #0
0816          BLE     C80
0817          LDD     #256
0818          BRA     C81
0819 C80      BEQ     C81
0820          LDD     #$FF00
0821 C81      STD     VOUT
0822          LDB     XSCLO2,X
0823          ANDB    #$7F
0824          STB     TVEC
0825          LDB     TARGT2
0826          ANDB    #$7F
0827          SUBB    TVEC
0828          BNE     C82
0829          RTS
0830 C82      BGT     C83
0831          LDD     VOUT
0832          SUBD    #02
0833          STD     VOUT
0834          RTS
0835 C83      LDD     VOUT
0836          ADDD    #02
0837          STD     VOUT
0838          RTS
0839 ANTISH   LDD     XVLOC,X
0840          STD     TLOC
0841          LDA     XVBIT,X
0842          STA     TBIT
0843          LDY     STSH
0844 C17      LDA     ,Y
0845          BGE     C18
0846          RTS
0847 C18      ANDA    #$40
0848          BEQ     C19
0849          LDA     #$C0
0850          LDB     TBIT
0851          BEQ     C21
0852 C20      LSRA
0853          LSRA
0854          DECB
0855          BNE     C20
0856 C21      COMA
0857          ANDA    [TLOC]
0858          STA     [TLOC]
0859 C19      JSR     NXTSET
0860          BRA     C17
0861 *
0862 OKMOV    LDD     VLOC
0863          STD     TLOC
0864          LDA     VBIT
0865          STA     TBIT
0866          LDY     STSH
0867 O02      LDA     ,Y
0868          BGE     O03
0869          LDA     #$04
0870          TFR     A,CC
0871          RTS
0872 O03      ANDA    #$40
0873          BEQ     O04
0874          LDA     #$C0
0875          LDB     TBIT
0876          BEQ     O05
0877 O06      LSRA
0878          LSRA
0879          DECB
0880          BNE     O06
0881 O05      ANDA    [TLOC]
0882          BEQ     O04
0883          CLRA
0884          TFR     A,CC
0885          RTS
0886 O04      JSR     NXTSET
0887          BRA     O02
0888 BSTATE   CLR     BUTTON
0889          LDA     65280
0890          CMPA    #255
0891          BEQ     NOTP
0892          CMPA    #127
0893          BEQ     NOTP
0894          INC     BUTTON
0895 NOTP     RTS
0896          RTS
0897 *
0898 * The following table should be
0899 * included with each program.
0900 *
0901 IXSTRT   EQU     *-9
0902 CH1LOC   EQU     *+1
0903 CLIST    RMB     900
0904 CLEND    EQU     *-1
0905 ZZZ      EQU     *
0906 BLUEUP   EQU     $49
0907 BLUEUR   EQU     $59
0908 BLUERT   EQU     $51
0909 BLUEDR   EQU     $55
0910 BLUEDN   EQU     $45
0911 BLUEDL   EQU     $65
0912 BLUELF   EQU     $61
0913 BLUEUL   EQU     $69
0914 BLUE     EQU     $41
0915 REDUP    EQU     $4A
0916 REDUR    EQU     $5A
0917 REDRT    EQU     $52
0918 REDDR    EQU     $56
0919 REDDN    EQU     $46
0920 REDDL    EQU     $66
0921 REDLF    EQU     $62
0922 REDUL    EQU     $6A
0923 RED      EQU     $42
0924 WHTUP    EQU     $4B
0925 WHTUR    EQU     $5B
0926 WHTRT    EQU     $53
0927 WHTDR    EQU     $57
0928 WHTDN    EQU     $47
0929 WHTDL    EQU     $67
0930 WHTLF    EQU     $63
0931 WHTUL    EQU     $6B
0932 WHITE    EQU     $43
0933 BLKUP    EQU     $48
0934 BLKUR    EQU     $58
0935 BLKRT    EQU     $50
0936 BLKDR    EQU     $54
0937 BLKDN    EQU     $44
0938 BLKDL    EQU     $64
0939 BLKLF    EQU     $60
0940 BLKUL    EQU     $68
0941 BLACK    EQU     $40
0942 UP       EQU     $08
0943 RIGHT    EQU     $10
0944 DOWN     EQU     $04
0945 LEFT     EQU     $20
0946 DONE     EQU     $FF
0947 *
0948 * CLIST FIELD OFFSETS
0949 XSHAPE   EQU     0
0950 XSCLOC   EQU     1
0951 XSCLO2   EQU     2
0952 XAUX     EQU     3
0953 XVLOC    EQU     4
0954 XVBIT    EQU     6
0955 XVECT    EQU     7
0956 XNEXT    EQU     9
0957          ORG     DPVAL*256
0958 TMP1     RMB     1
0959 TMP2     RMB     1
0960 TMP3     RMB     1
0961 SCRLOC   RMB     1
0962 SCRLO2   RMB     1
0963 SHAPE    RMB     1
0964 VLOC     RMB     2
0965 VBIT     RMB     1
0966 TBIT     RMB     1
0967 TLOC     RMB     2
0968 VOUT     RMB     1
0969 VOU2     RMB     1
0970 STSH     RMB     2
0971 TVEC     RMB     2
0972 RND1     RMB     1
0973 AUX      RMB     1
0974 GRAVTY   RMB     2
0975 TARGET   RMB     1
0976 TARGT2   RMB     1
0977 BUTTON   RMB     1
0978          END
```

The COCO hardware store

CRC COMPUTERS

Fantastic Super Controller II

- **Radio Shack/Tandy controller compatible.**
- **Works on all COCOs - 1, 2 or 3 with or without Multi-Pak Interface.**
- **One 24/28 pin socket for 8K ROM, 2764, or 27128 EPROM.**
- **Internal MINI-EXPANSION-BUS connector for one DISTO Super Add-On.**
- **Low Power draw; within COCO's requirements.**
- **Gold Plated edge connectors.**
- **Under OS-9:**
  - Buffered Read/Write sector achieved without halting the CPU.
  - Continual use of keyboard even while reading or writing to disk.
  - System's clock no longer looses time during Read & Write.
  - NMI is blocked and transferred to IRQ in software for low CPU overhead.
  - Completely Interrupt driven for fast & smooth Multi-Tasking operations.
  - Drivers written by KEVIN DARLING

$130.

DISTO Super Controller I

$99.95

A Superb Controller. Along with the included C-DOS, plug-in three more software selectable DOSes or 2764 or 27128 EPROMs burned to your liking.

The Internal Mini-Expansion-Bus lets you add some incredible features to the controller. Disto Super Add-Ons were designed to fit neatly inside the controller case.

DISTO SUPER ADD-ONS

- **Real Time Clock & Printer Interface** — **$39.95**
  Have the Real Time, Date and Year displayed on your screen at a simple command.
- **Mini EPROM Programmer** — **$54.95**
  A LOW COST EPROM Programmer that attaches directly to any Disto Super Controller or MEB adapter to program those often used utilities.
- **Hard Disk Interface** — **$49.95**
  A Hard Disk Interface fully compatible with SASI controller. Fits inside the Super Controller, Ramdisk or MEB Adapter. OS-9 drivers included. Also available with RS-232 Serial Port.
- **Super RAM 3 ZeroK Board** — **$CALL**
  Now is the time to upgrade your COCO 3 to 512K of memory. Just add the memory chips and install in your COCO 3.
- **MEB Adapter** — **$24.95**
  A Stand-Alone Mini-Expansion-Bus in which you can plug any other Disto Adapter directly in a Multi-Pak without the need for a Super Controller or Ramdisk.

NEW DISTO 3 in 1 Multi-Board Adapter

$59.95

This Muti-Board is an adapter that plugs in any Disto Super Controller, Ramdisk or MEB Adapter.

It includes a new and improved Printer Port (Centronics compatible), a faster Real Time Clock (works at 2MHz.) and a true RS-232 Serial Port (external 12 volt AC adapter required). DB25 cable included.

It fits neatly inside the metal case and is still within Tandy's power limits. It also works with or without a Multi-Pak.

NEW DISTO RS-232 SuperPack

$49.95

- A Stand-Alone (Multi-Pak required) adapter that gives the user a true RS-232 Serial Port.
- Completely compatible with OS9's ACIA software.
- Compatible with software that requires the Tandy Deluxe RS-232 Pack.
- DB-25 cable included.

4 in 1 Super Board

Coming this fall to a dealer near you

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Simplify and organize Adventure playing without ruining the fun

Adventure Game Mapping Techniques

By John Dillon

Adventure games can perhaps be defined as logical puzzles involving people in unusual situations. Using this definition, it is fair to say that Adventures have been with us for generations. Over a hundred years ago Sam Loyd was delighting readers with hundreds of situations that required careful thought and mapmaking ability. Even a traditional detective story is an adventure — the reader wanders through an assortment of rooms, finding clues and trying to figure out "who done it" and where the treasure is hidden.

However, in a novel the reader has no control over the detective's words or action — the reader is a purely passive player. (The term "player" was chosen over "spectator" because a well-written novel will get the reader more involved than merely spectating.)

Our current concept of Adventure games overcomes the passivity of literary adventures. No longer must a player watch in frustration as the hero drinks a fluid that *everyone* knows is poison — now the player can shatter the vial instead, realizing too late that the fluid is nitro-glycerin!

Because the players are now in control of the action, it becomes imperative that they understand their surroundings and position amidst them. As in the days of yore, the best way to know where you are is to make and use a map. While there are a variety of techniques available, this article will focus on a method that has been personally successful. First, a couple of comments are in order. One: Let us define a "room" as any unique position in the game, whether it is an actual room, a pathway or corridor, or even a section of a single chamber. Two: *Use a pencil!* Though this is intuitively obvious, it is still frequently overlooked. Cartography is a detailed process that usually requires many changes before an acceptable final product is obtained.

John Dillon is an engineer for Rockwell International, designing automatic test equipment and writing control code for the instruments. He is also a songwriter and a student. His hobbies include reading and travelling by motorcycle.

Mapmaking Tools

It has been said that a sign of man's intelligence is his ability to make and use tools. A useful tool for Adventurers is a mapsheet devised to ease the chore of Adventure mapping. [See Neil Haupt's *Mapper* program (August '87, Page 90), which prints a blank mapsheet on an 80-column printer.] While it is quite simple to use, it can contain a lot of information. Here is the procedure, using Figure 1 as an example.

First, arbitrarily select and label a box as the game's starting point. Then indicate the obvious exits with short labeled stubs. In this example, the game starts with "You are in front of a castle. Obvious exits are North and East. You see nothing special." Figure 1a shows this starting room (labeled "Front of Castle") and the possible exits ('N' and 'E'). Note that north doesn't have to be up as on a regular map. Just be sure to label the map such that there is no confusion.

Next, try to discover where each of the exits go. In this game, going east would put you on a drawbridge, while north plants you firmly in the forest. When you enter a new room, repeat the process of Step 1, e.g., label the room and show possible exits as shown in Figure 1b.

Now that you have explored the obvious exits for the starting room, go back (if you can) and try unmarked directions, since sometimes you can travel in directions not explicitly described. For example, in trying "down" from the front of the castle, you discover that "You are now wading in the moat. Several crocodiles are eyeing you hungrily." This means that you need to add a room, as shown in Figure 1c.

Sometimes a passage is unidirectional (Figure 1d). Indicate this with an arrowhead to show that you can't get back. For example, after trying all other directions while in the moat, you discover that you can't return to the front of the castle because "The banks are too steep and slippery; you keep falling back into the water."

After exploring all possible exits (including Climb, Jump, Run, etc., if appropriate) for a particular room, it's useful to mark the map so that you know that all exits have been exhausted. One way is to put an 'X' in the lower left corner, as shown in Figure 1e.

Figure 1f shows some other useful

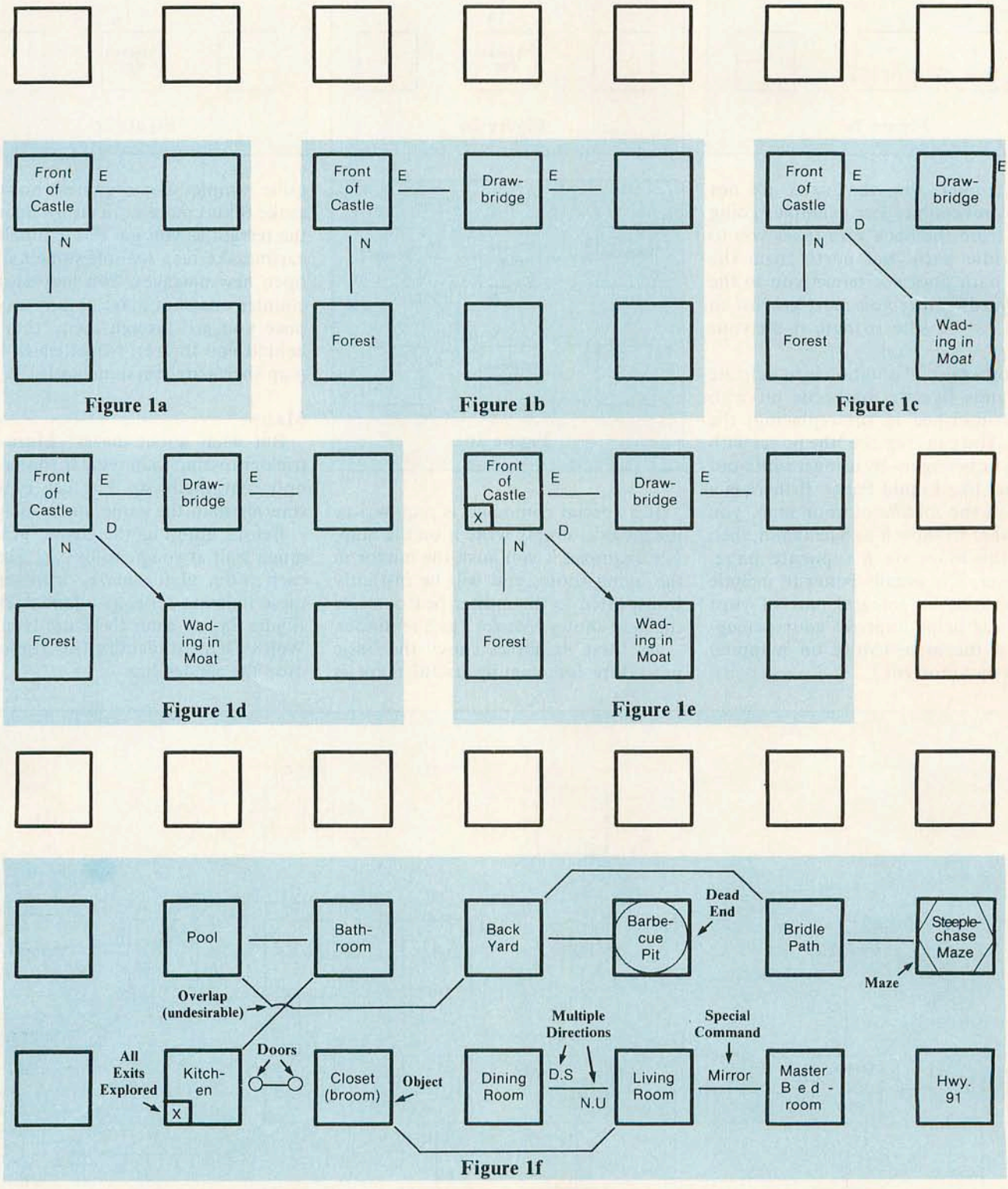


Figure 1

mapping notations. A small circle on a box indicates that a door has to be opened before you can exit in that direction. Parentheses can identify the objects found in a room, such as a broom in the closet. If multiple directions take you to the same room, you can indicate both on a single line, such as in the living room.

After a while the map may get convoluted, with one path crossing another a dozen times. When this happens, carefully redraw the map on a new mapsheet. Often, with judicious layout, you can eliminate crossovers.

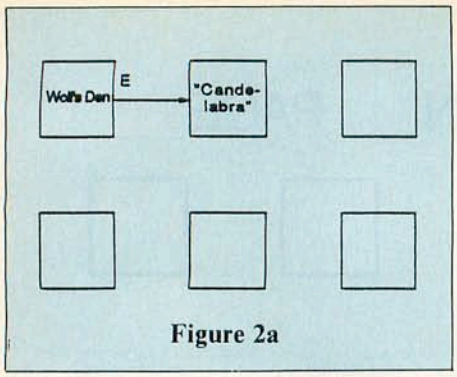


Figure 2a

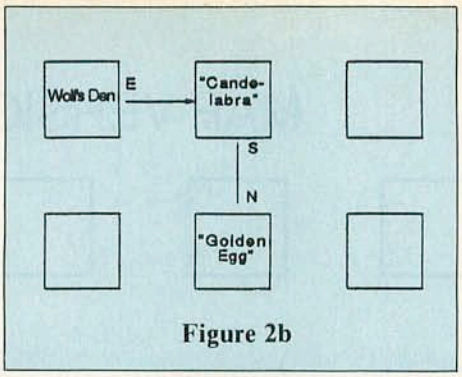


Figure 2b

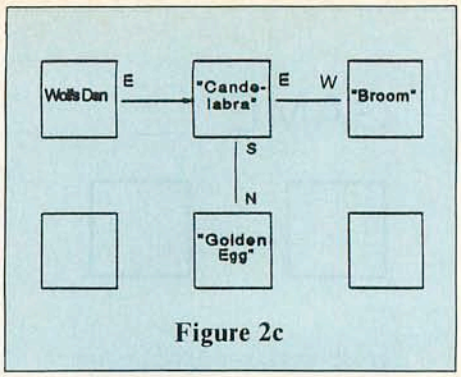


Figure 2c

Remember, too, that exits are not always reversible. For example, going south from the back yard takes you to the bridle path, but north from the bridle path does *not* return you to the back yard; rather you must go east to return, so be sure to note it on your map.

Another useful notation is to indicate dead ends like the barbecue pit with circles inscribed in (or replacing) the boxes. You can "replace" the boxes with circles or hexagons by using a white-out product like Liquid Paper. If there is a maze in the *middle* of your map, you may want to show it as a hexagon, then map the maze on a separate page. However, it is usually better to include the maze as an integral part of your map; this helps improve your perception of the area. (More on mapping mazes in a moment.)

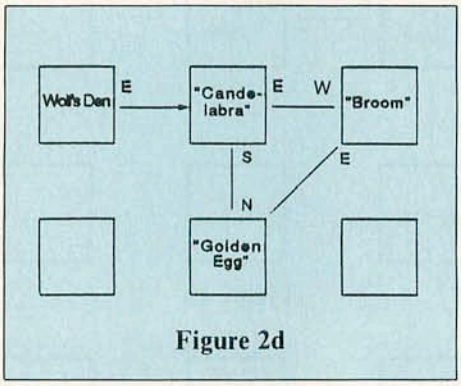


Figure 2d

If a special command is required to use an exit, simply write it on the map. For example, if you push the mirror in the living room, you will be instantly transported to the master bedroom, so the map shows "Mirror" as a reminder.

As these examples show, the basic procedure for creating useful maps is quite simple. Some games, however, make things more difficult by changing the terrain as you go. For example, an earthquake may seal off some exits or open new passages. You may also encounter one-shot magical doorways — once you go through them, they seal behind you forever. Nonetheless, these map sheets are still quite useful.

Mazes

But what about mazes? Mazes are trickier to map than regular rooms, but only marginally so. The key is to be smarter than the game you're playing.

Before entering the maze, grab as much stuff as you possibly can. Then in each room of the maze, drop one of these items to serve as a landmark. In Figure 2a, we enter the maze from the Wolf's Den; to identify this room, we drop the candelabra.

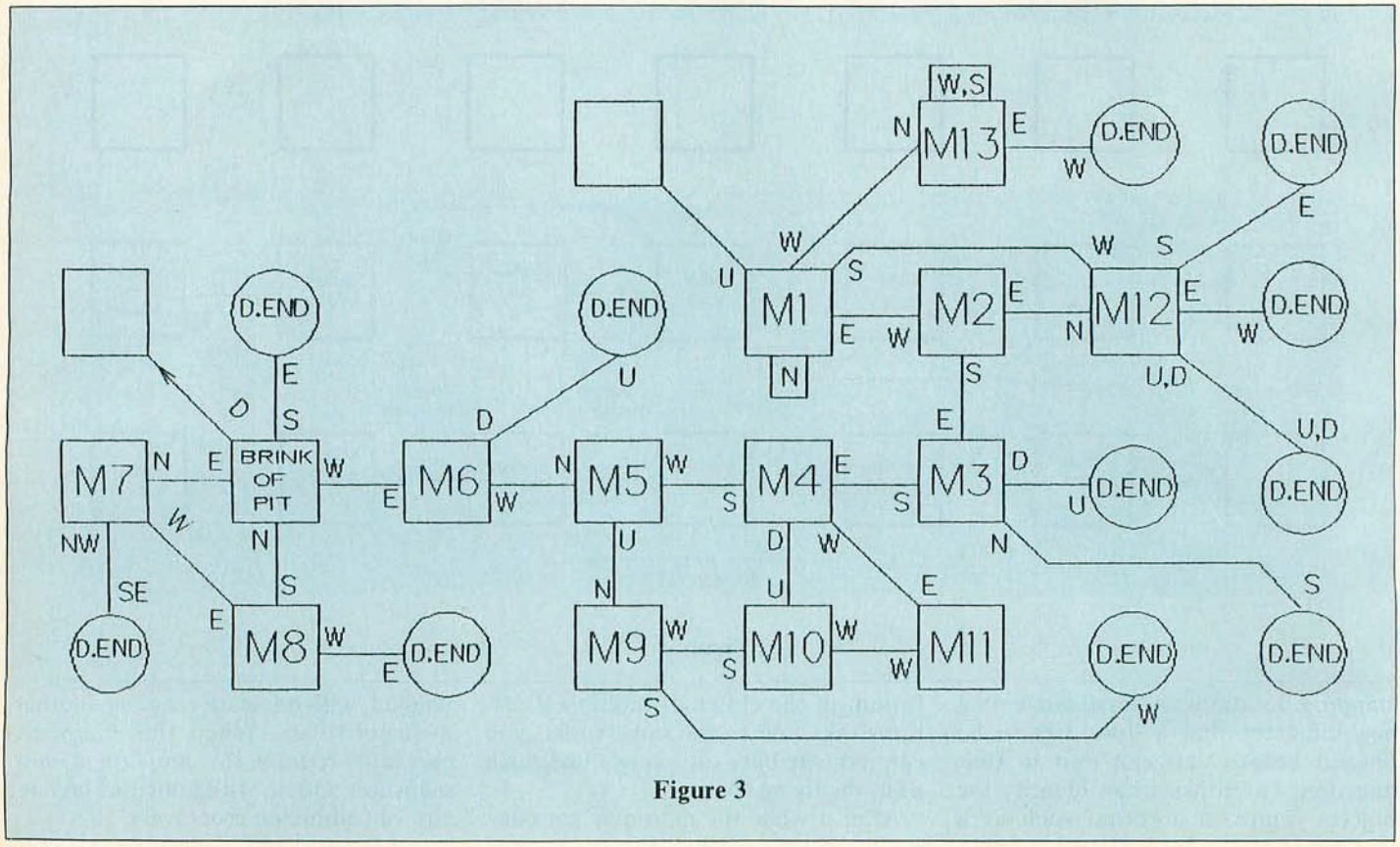


Figure 3

As we wander around the maze, we continue to drop stuff behind us, marking the items we left on our map. (By the way, it is important to wander through the maze in a logical fashion, using the same techniques discussed earlier.) In our example, going south from "candelabra" (Figure 2b) put us in another maze-room, so we drop another item, this time the golden egg. Our inquisitive minds want to check the backward path, so we go north from "golden egg," and *voila!* we are indeed back in the "candelabra" room. Next we try east, ending up in "broom" (Figure 2c). West from "broom" puts us back at "golden egg," and we have already established some order to what once seemed to be a formidable labyrinth (Figure 2d).

As you get deeper into the maze, you must go back to the beginning portion to retrieve and reuse your landmark objects. If your game has a Save feature, using it can expedite this process.

After the maze has been solved, identify these rooms on your map as M1, M2, M3, etc., where 'M' stands for "maze." Figure 3 shows a portion of the maze in one of Radio Shack's more popular Adventures.

"By using mapmaking tools, solving Adventures becomes a simpler, more organized task — without depriving you of any of the fun and challenge."

Sometimes a game may have more than one maze. RAINBOW's *Rescue on Alpha II*, for example, has both the caverns and botanical gardens. As a result, my map shows rooms BG1, BG2, etc., and C1, C2, C3, etc., thereby keeping them distinct.

For more information on mapping mazes (and on Adventure games in general) refer to *Compute!'s Guide to Adventure Gaming*. It is also an excellent reference source for people who want to write their own games. It was this book that first taught me the key to maze mapping.

Though Adventure games are exciting and challenging, they are also relaxing. Upon solving a good Adventure, you are left with a feeling of satisfaction knowing that you are clever enough to outwit a computer. By using mapmaking tools such as those described in this article, solving Adventures becomes a simpler, more organized task — without depriving you of any of the fun and challenge. Good luck, and may you always be smarter than the games you play!

(Questions or comments concerning this tutorial may be directed to the author at P.O. Box 6026, Fullerton, CA 92634. Please enclose an SASE when requesting a reply.)

One-Liner Contest Winner . . .

I read with interest Dennis Weide's article in the February '88 issue (Page 126) concerning reversing the PMODE screen in BASIC and Pascal. His BASIC program took one hour, and his Pascal program took one minute. My one-liner uses some of CoCo BASIC's built-in commands to perform the same task in 30 seconds! By using GET, PUT and PCOPY, CoCo can do the job quickly and efficiently — without peeks, pokes or Pascal!

The listing:

```
1 PCLEAR8:PMODE4,5:PCLS:SCREEN1,
1:DIMIN(256):Y=255:FORX=ØTO255:P
MODE4,1:GET(Y,Ø)-(Y,191),IN,G:PM
ODE4,5:PUT(X,Ø)-(X,191),IN,PSET:
Y=Y-1:NEXTX:FORJ=1TO4:PCOPYJ+4TO
J:NEXTJ
```

John Collicott
Inman, KS

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape*.)

Two-Liner Contest Winner . . .

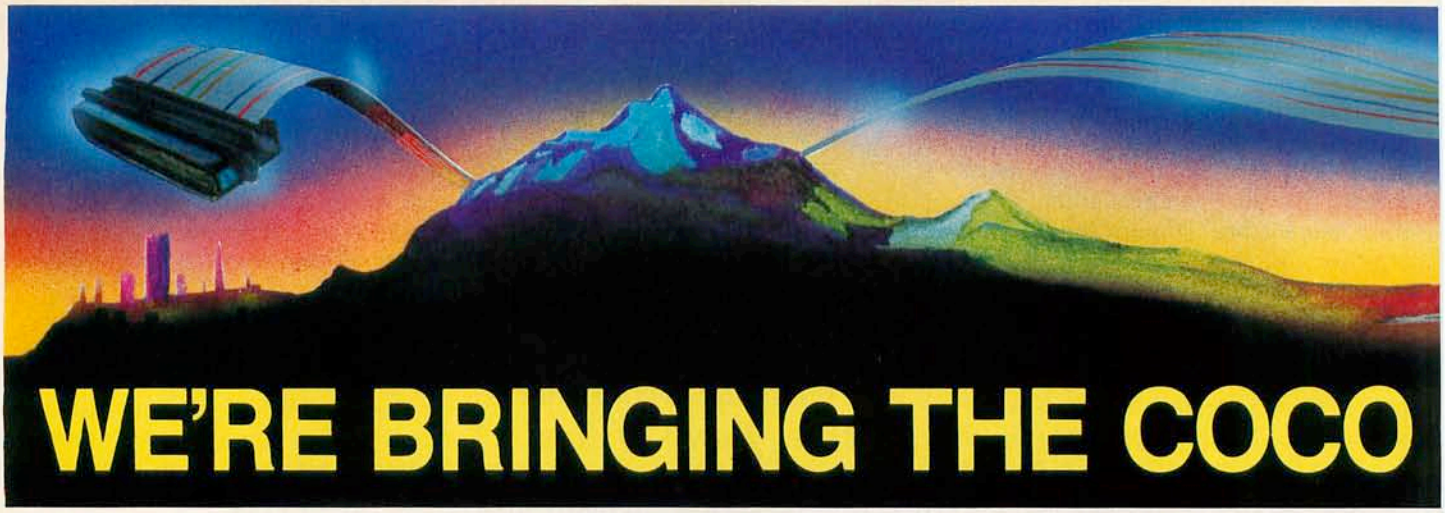
Here is a CoCo 3 expression of a sentiment most undoubtedly felt by all CoCo owners!

The listing:

```
1Ø PMODE3,1:PCLS3:SCREEN1,Ø:CIRC
LE(128,99),9Ø,4,.95:PAINT(128,99
),4,4:COLOR2:DRAW"BM128,4ØR9L18R
9D2ØR9L18":DRAW"BM6Ø,7ØD2ØR18BM8
8,7ØD2ØR18U2ØL18BM117,7ØD2ØR18U2
ØBM146,7ØD2ØR18L18U1ØR18L18U1ØR1
8BM146,1ØØD2ØU2ØR9D1ØU1ØR9D2ØBM1
75,1ØØD2ØR18U2ØD4Ø"
2Ø POKE65495,Ø:DRAW"BM8Ø,13ØD2ØR
18L18U2ØR18BM1Ø8,13ØD2ØR18U2ØL18
BM136,13ØD2ØR18L18U2ØR18BM164,13
ØD2ØR18U2ØL18":PAINT(Ø,Ø),1,4:PA
INT(Ø,Ø),2,4:PAINT(Ø,Ø),3,4:PMOD
E3,1:SCREEN1,1:PAINT(Ø,Ø),2,4:PA
INT(Ø,Ø),1,4:PAINT(Ø,Ø),3,4:PMOD
E3,1:SCREEN1,Ø:RUN
```

Doug Fingliss (Age 9)
Tiverton, RI

(For this winning two-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape*.)



WE'RE BRINGING THE COCO

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THE RAINBOW and the Delphi Information Utility have joined together *to allow CoCo owners* all over the world to connect with one another!

Delphi is a full-service information utility. It offers everything from up-to-the-minute news stories from The Associated Press to electronic mail services. But, *best of all*, it now has **a special forum for Color Computer owners, and it's operated by the people who bring you THE RAINBOW each month.**

The CoCo Special Interest Group (SIG) features a variety of services, including an open forum where you can send and receive messages from Color Computer owners all over the world. It also has several databases to which you can upload your favorite programs and from which you can download programs written by other CoCo enthusiasts. Some of these databases are BASIC programming, OS-9 and home applications.

When setting up your account with Delphi, if you do not have a credit card or prefer not to use it, Delphi requires that you send $25 to give *your* account a positive balance. This will be refunded after your first free hour if you choose to no longer use the system or it will be applied to future connect charges. If you do not maintain a positive balance, you will be charged $3.50 each month for direct billing.

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The CoCo SIG's conference feature allows you to meet electronically with other members of the CoCo Community. You can join conferences with notables such as Dale Puckett, Cray Augsburg, Marty Goodman, Don Hutchison, Jim Reed, Lonnie Falk and others — on a regular basis. Conference schedules will appear in THE RAINBOW each month. Be sure to check online announcements for changes and additions.

THE OTHER SIDE OF THE RAINBOW

On Delphi, you also are able to buy RAINBOW ON TAPE — order a whole set, or download an individual program immediately. You can also renew your RAINBOW subscription, make a fast and easy order for software or hardware from a multitude of vendors, or inquire about products on the CoCo SIG.

We also have a number of **programs that you can download** and use, just for the cost of the time you spend transferring them. There'll also be **corrections for RAINBOW articles**, helpful hints and many other useful features.

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DELPHI

TYPE:
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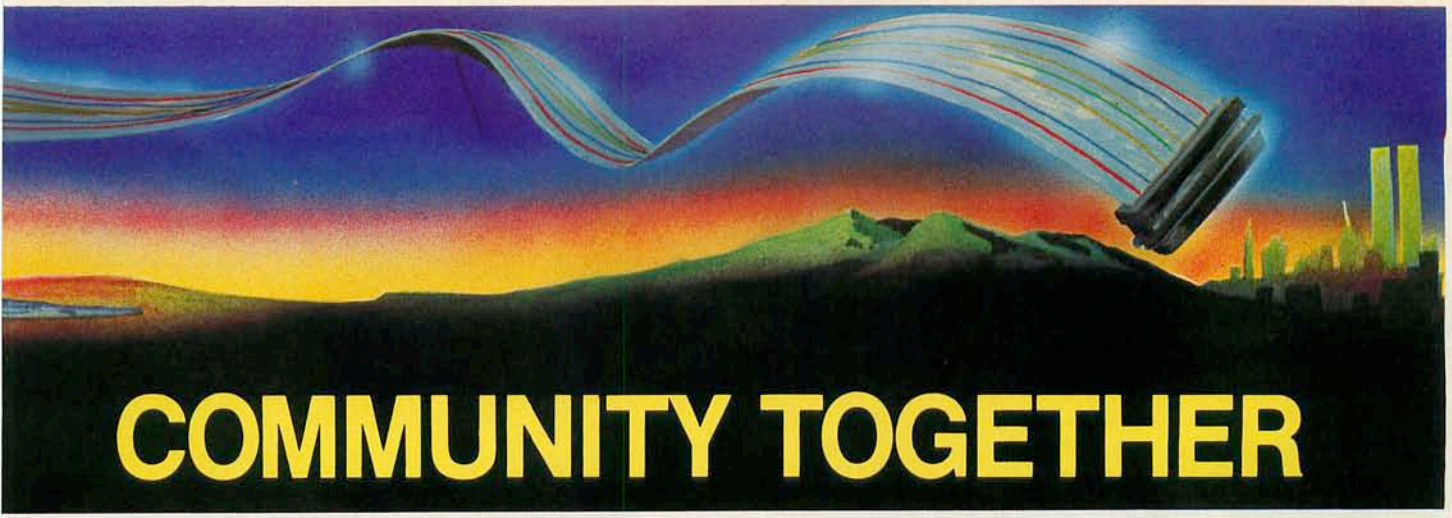


COMMUNITY TOGETHER

How to reach RAINBOW's Color Computer SIG . . .

There are several ways to connect to Delphi and THE RAINBOW's CoCo SIG. In most cities you will not even have to pay long distance charges; you can use special data communications networks like Telenet, Tymnet and the Canadian Datapac network.

First, set your terminal program to operate at either 300 or 1200 Baud (depending on the modem you have), and also select either 7 bits with even parity or 8 bits with no parity, and one stop bit. (If one combination doesn't work, try another.)

Decide which network you should use. There is no surcharge for Telenet or Tymnet. Canadian residents using Datapac will be charged an additional $10.80 (U.S.) per hour.

On Telenet: Uninet network has merged with Telenet. To get the Telenet number for your area, call (800) 336-0437. After you call the local access number and make connection, press ENTER twice. When the "TERMINAL=" prompt appears, press ENTER again. When the "@" prompt appears, type C DELPHI and press ENTER.

On Tymnet: Call (800) 336-0149 to get the Tymnet number for your area. After you dial your designated number and connect, you will see either "garbage" or a message saying "please type your terminal identifier." At this point, even if the screen is garbled, simply press 'A'. When "please log in:" appears, type DELPHI and press ENTER.

From Canada (on Datapac): Call Delphi Customer Service at (617) 491-3393 to get the Datapac number for your area. After you connect, press the period key (.) and ENTER (use two periods if you're using 1200 Baud). Type SET 2:1, 3:126 and press ENTER. Now type p 1 3106, DELPHI; and press ENTER. Delphi's new rates indicate an additional $10.80 hourly surcharge for evening use of Datapac, which means a total of $18 (U.S.) for connect time.

From other countries: Many countries have their own data networks that can connect to either Telenet or Tymnet. Check with the telephone authorities in your country for details on how to sign up for this service. When you have an account set up, you can reach Delphi with a "host code" of 3110 6170 3088 through Telenet, or 3106 90 6015 through Tymnet. (You'll have to pay the toll charges for this connection.)

Type in Your Username

If you're already a subscriber to THE RAINBOW, at the "USERNAME:" prompt, type JOINDELPHI and press ENTER. At the "PASSWORD:" prompt, type RAINBOW. Then, at the "NUMBER:" prompt, type your individual subscription number from the mailing label of your latest issue of THE RAINBOW. (If there are one or more zeros at the beginning of this number, include them.)

If you don't already have a subscription, at the "USERNAME:" prompt, type JOINDELPHI and press ENTER. At the "PASSWORD:" prompt, type SENDRAINBOW and press ENTER. Have your MasterCard, VISA or American Express card ready, because you'll be led through a series of questions that will enable us to put your RAINBOW and Delphi subscriptions into effect. In an effort to hold down non-editorial costs, we do not bill for subscriptions.

If you make a typing error, just use Control-X and start over. Remember that at any point, when you're on Delphi, you can type HELP to get help on how to use the system. To get off the system just type BYE.

If you find that you're unable to log on to Delphi and enter the CoCo SIG after following these instructions, call us during afternoon business hours at (502) 228-4492. We'll be glad to offer assistance.

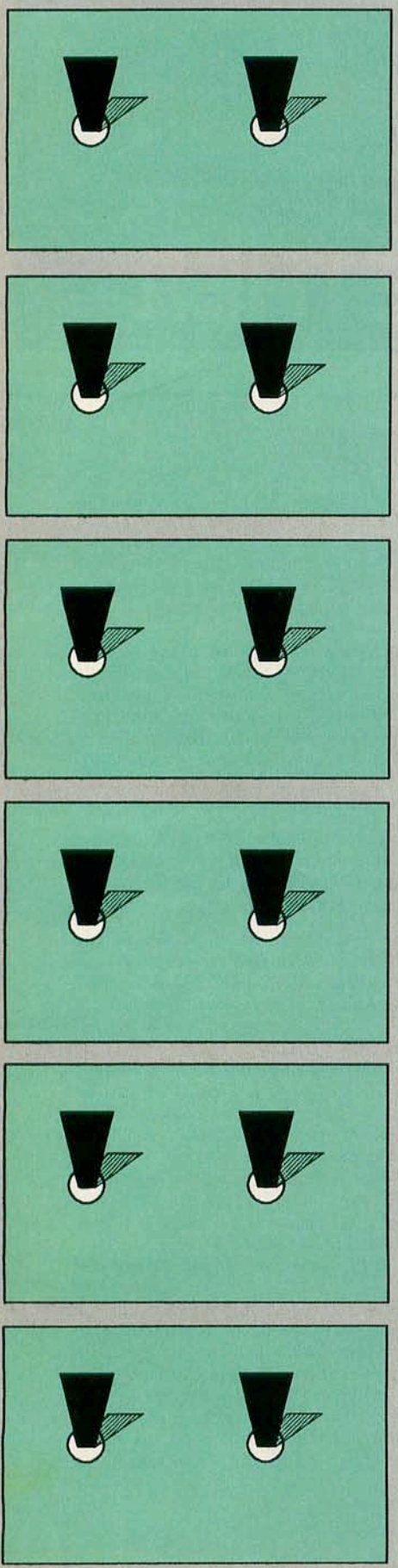
Come Visit Us! Type: GROUP COCO

After you sign in, you'll be prompted to set up your own, personal "user name" — Delphi is a friendly service, no numbers to remember — and you'll be asked a number of questions so Delphi can set up your account. You'll also be assigned a temporary password.

Delphi will tell you that your account will be ready after 6 p.m. the same day if you sign up before noon (Eastern time zone.) If not, your account will be ready at 6 p.m. the next day. Once an account is verified and opened, *each RAINBOW subscriber will be credited with an hour of free time!*

When you log back in, use your chosen username and your temporary password to access the system. At that point, you will meet Max, who will help you configure things and will change your temporary password into your own *personal* password. This is the password you will use for subsequent sessions — or until you change it.

After Max bids you goodbye, you'll wind up at the Delphi Main Menu; type in GROUP COCO and **join us on the CoCo SIG!**



A hardware project to handle the switching of the joystick and cassette ports.

The Old Switcheroo II

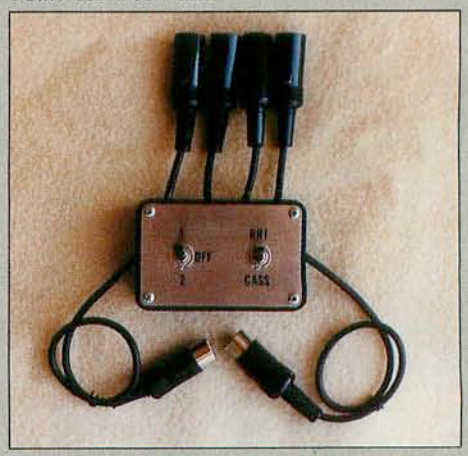
By Mark Haverstock

In the August '86 RAINBOW [Page 108], I presented a hardware project designed to switch among joysticks, trackballs, mice and other devices that use the joystick ports. It was designed to save CoCo owners the hassle of plugging and unplugging these items by allowing one joystick port to accommodate more than one device.

With the introduction of Tandy's Hi-Res Joystick Interface, another problem appears. Both the joystick port and cassette port must now be shared with the Hi-Res Interface. Enter the Old Switcheroo II. This switchbox will handle the switching of both the joystick and cassette ports. Armed with a few inexpensive parts and tools, you can build this convenient accessory for your CoCo 2 or 3.

The Joystick Switcher

Based on comments from several readers who wrote to me about the joystick switcher, I learned that most use the project to switch only two items, such as a mouse and a joystick. The new version is set up to switch two items. It also has a center OFF position to disable both devices. The OFF position is particularly important for programs that are adversely affected by having joysticks plugged in during operation. A double-pole, double-throw switch has been substituted for the rotary switch that appeared in the original version because it is easier to wire. The switcher can be used with either joystick port, or with external devices such as the *CoCo Max* Hi-Res Pak.



The Cassette Port Switcher

The Hi-Res Joystick Interface (Cat. No. 26-3028) uses both the joystick and cassette ports. This, of course, presents a problem for cassette recorder users who will need to plug and unplug the recorder. The Switcheroo II utilizes a double-pole, double-throw switch also to activate either the cassette recorder or the Hi-Res Interface.

You will need the following parts: One six-pin DIN plug (Cat. No. 274-

Mark Haverstock teaches computer applications for the Boardman schools in Youngstown, OH. His hobbies include computing, photography and amateur radio.

020); two six-pin inline DIN jacks (Cat. No. 274-021); a five-pin DIN plug (Cat. No. 274-003); two five-pin inline DIN jacks (Cat. No. 274-005); an experimenter box (Cat. No. 270-2301); a DPDT switch with a center OFF position (Cat. No. 275-664); a DPDT switch (Cat. No. 275-663); 4 feet of five-conductor wire; dry-transfer lettering; epoxy; and electrical tape or heat-shrink tubing.

The required tools include the following: a drill, ¼-inch drill bit, flat metal file, small screwdriver, small Phillips screwdriver, wire strippers, pliers, soldering iron and solder.

Construction

Construction of the Switcheroo II will be described in three parts: the preparation of the project box, wiring the joystick port switch, and wiring the cassette port switch. Do each in order to avoid wiring errors.

First, take the metal cover off the project box, removing the four Phillips screws at each corner. Mark the positions of the holes to be drilled in the plastic portion of the box (see Figure 1). Then drill these holes using the ¼-inch drill bit. Use the file to remove any burrs from the inside of the box.

Mark the positions of the switch mounting holes on the metal cover. Drill these holes with the ¼-inch drill bit. Again, remove any burrs from the rear of the cover. Find the positions for SW1 and SW2 as shown in Figure 1, and apply dry transfer lettering at these positions.

Switch 1-Joystick Port

The next step is to wire SW1 for the joystick port. If you cannot obtain five-conductor cable, substitute five #22-gauge

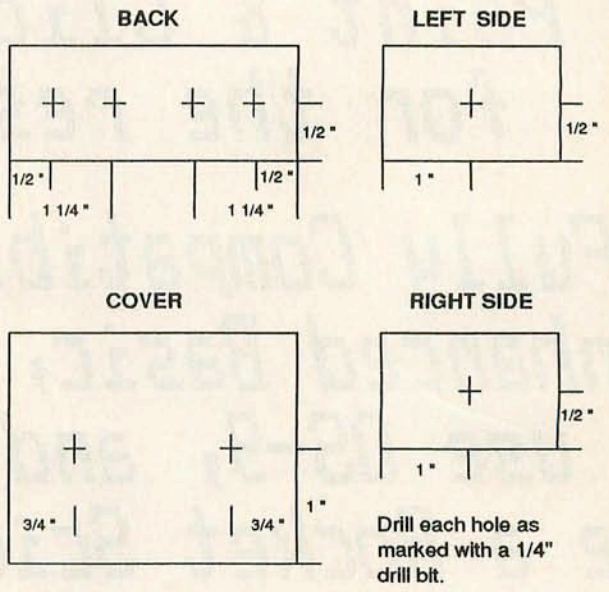
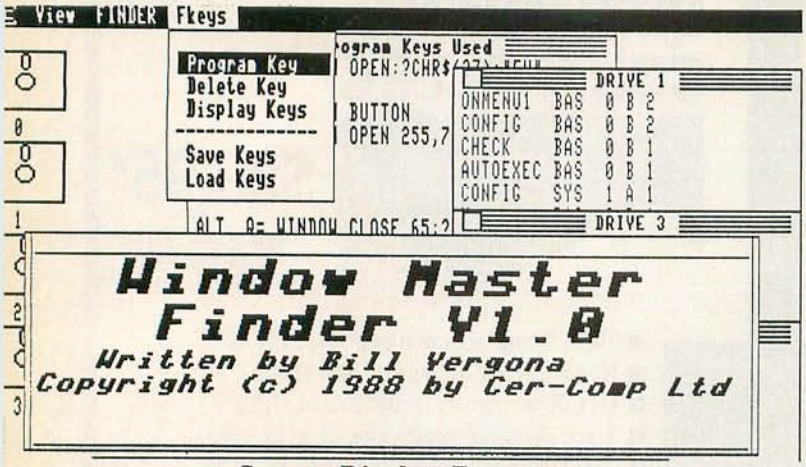


Figure 1: Preparation of The Switcheroo Enclosure.

"Window Master"

A Point & Click Window System for the rest of us !!!

Fully Compatible with R.S. Dos Enhanced Basic, it does not need or use OS-9, and you don't have to be a Rocket Scientist or a P.H.D. to use Windows, Pull Down Menus, Buttons, Icons, Edit fields or Mouse Functions in your Programs!



Screen Display Fonts

Window Master supports up to 54 different character sizes on the screen with 5 different character styles. You can have Bold, Italic, Underlined, Super-Script, Sub-script or Plain character styles or any combination of them in any character size. You can also change the text color and background at any time to get really colorful displays.

Fully Basic Compatible

Window Master is fully compatible with Enhanced Color Disk basic with over 50 Commands & functions added to fully support the Point & Click Window System. Window Master does not take any memory away from Basic, so you still have all the Basic Program memory available.

Hi-Resolution Displays

Window Master uses the full potential of the Color Computer 3 display by using the 225 vertical resolution display modes instead of the 192 or 200 resolution modes like most other programs. It uses either the 320/16 color mode or the 640/4 color display to give you the best display resolution possible, and can be switched to either mode at any time.

Window Master Features

Multiple Windows

Window Master supports multiple window displays with up to a maximum of 31 windows on the screen. Overlapping windows are supported, and any window can be made active or brought to the top of the screen. Windows can be picked up and moved anywhere on the screen with the mouse. There are 6 different Window styles to choose from and the window text, border and background color is selectable.

Pull Down Menus

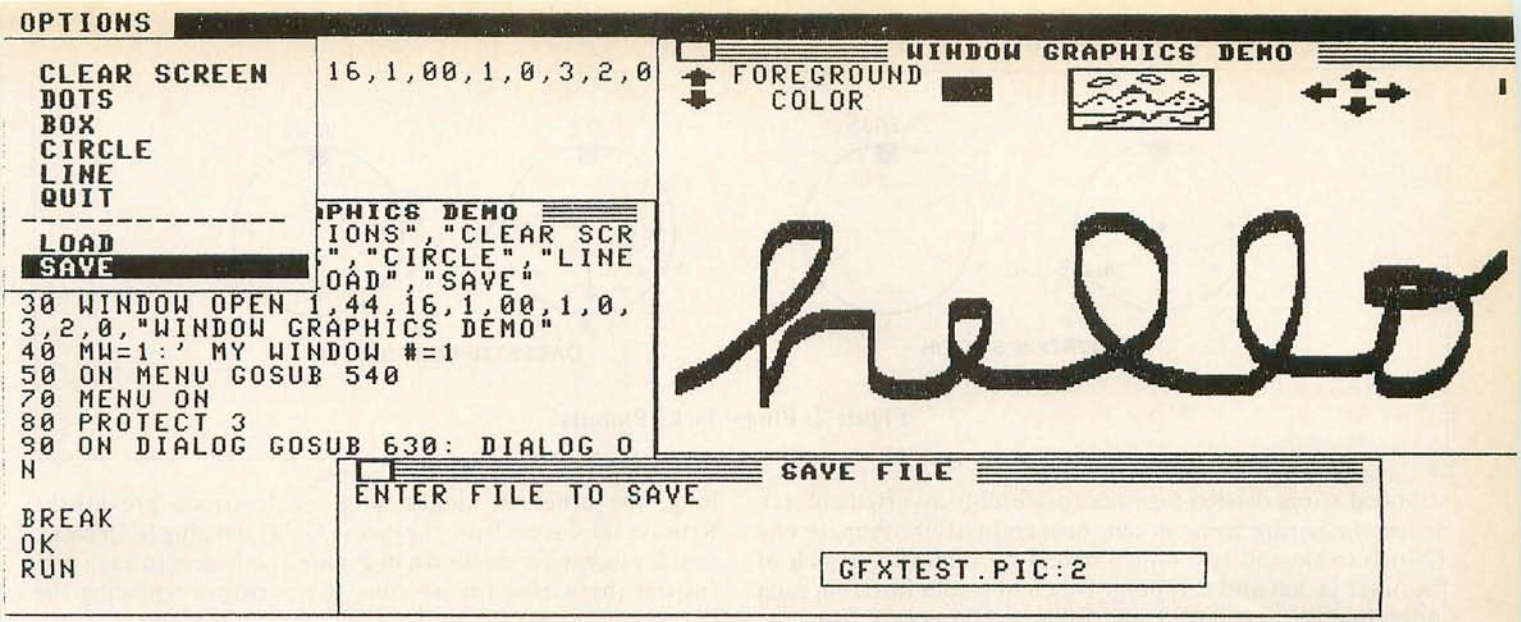
Menus are completely programmable with up to 16 menus available. They can be added or deleted at any time in a program. Menu items can be enabled, disabled, checked or cleared easily under program control. Menu selection is automatically handled by Window Master & all you have to do is read a function variable to find out which menu was selected.

Buttons, Icons & Edit Fields

Each Window can have up to 128 buttons, Icons or Edit fields active, if you can fit that many. Buttons, Icons and Edit field selection is handled automatically by Window Master when the mouse is clicked on one. All you have to do is read a Dialog function to find out which Button, Icon, or Edit field was selected, its very simple.

Mouse & Keyboard Functions

Window Master automatically handles the Mouse pointer movement, display and button clicks. It will tell you the current screen coordinate, the local window coordinate, window number the mouse is in, the number of times the button was pressed, which window number it was clicked in and more. The Keyboard is completely buffered, and supports up to 80 programmable Function keys that can contain any kind of information or command sequences you can imagine. You can load and save function key sets at any time. So, you can have special sets of function keys for different tasks. The "Ctrl" key is supported so that you have a full control code keyboard available.



Mixed Text & Graphics

Window Master fully supports both Text & Graphics displays and even has a Graphics Pen that can be used with HLINE, HCIRCLE, HSET and more. You can change the Pen width & depth and turn it on or off with simple commands. We also added Enhanced Graphics Attributes that allow graphics statements to use And, Or, Xor and Copy modes to display graphic information. With the Graphics enhancements added by Window Master, you could write a "COCOMAX" type program in Basic! In fact we provide a small graphics demo program written in Basic.

Event Processing

Window Master adds a powerful new programming feature to Basic that enables you to do "Real Time" Programming in Basic. It's called Event Trapping, and it allows a program to detect and respond to certain "events" as they occur. You can trap Dialog activity, Time passage, Menu Selections, Keyboard activity and Mouse Activity with simple On Gosub statements, and when the specified event occurs, program control is automatically routed to the event handling routine, just like a Basic Gosub. After servicing the event, the sub-routine executes a Return statement and the program resumes execution at the statement where the event occured.

Enhanced Editing Features

Window Master adds an enhanced editor to Basic that allows you to see what you edit. It allows you to insert & delete by character or word, move left or right a word or character at a time, move to begin or end of line, toggle automatic insert on/off or just type over to replace characters. The editor can also recall the last line entered or edited with a single key stroke. You can even change the line number in line to copy it to a new location in the program.

Window Master Applications

Window Master pushs the Color Computer 3 far beyond its normal capabilities, into the world of a "User Friendly" operating enviornment. We are already planning several new programs for use with Window Master. So you don't have to worry about having to write all your own programs. And don't forget that many existing Basic and M.L. programs will run under Window Master with little or no changes. The Possibilities for Application programs are endless: Spread Sheets, Word Processing, Communications, Education, Games, Graphic Design, Desk Top Publishing and on and on.

Hardware Requirements

Window Master requires 512K of memory, at least 1 Disk Drive, a Hi-Res Joystick Interface and a Mouse or Joystick.

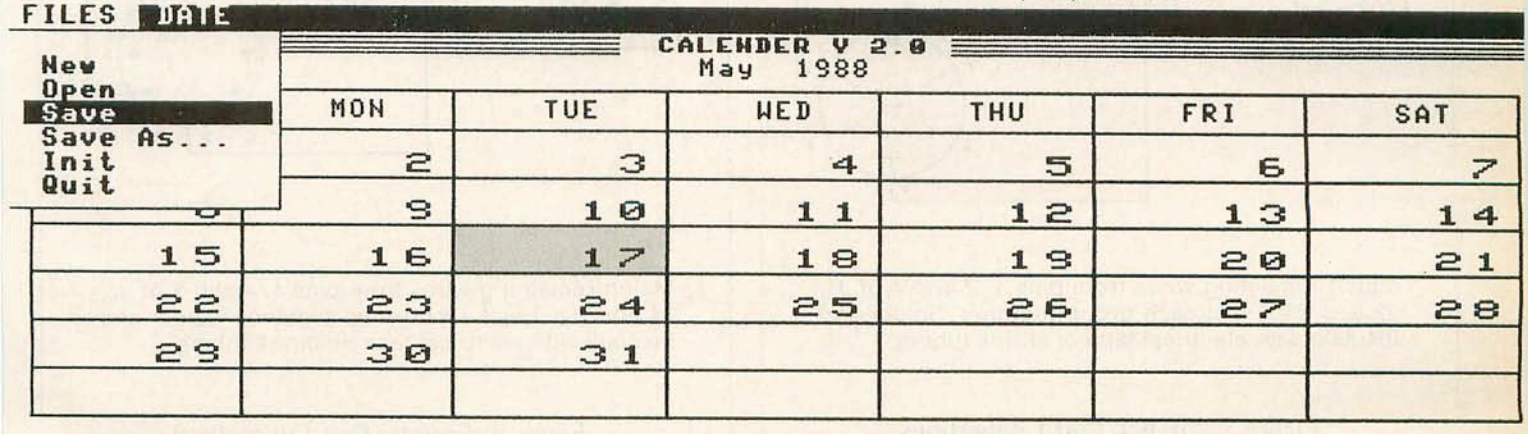
Technical Assistance

If you run into difficulty trying to use some of Window Master's features, we will be happy to assist you in any way possible. You can write to us at the address below or call us between 10am and 2pm Pacific Standard Time for a more timely response. Sorry, no collect calls will be accepted.

Ordering Information

To order WINDOW MASTER by mail, send check or money order for $69.95, plus $3.00 for shipping & handling to the address below. To order by VISA, MASTERCARD or COD call us at (702)-452-0632
(Monday thru Saturday, 8am to 5pm PST)

CER-COMP Ltd.
5566 Ricochet Avenue
Las Vegas, Nevada 89110
(702)-452-0632



Call for availability of 128K version!

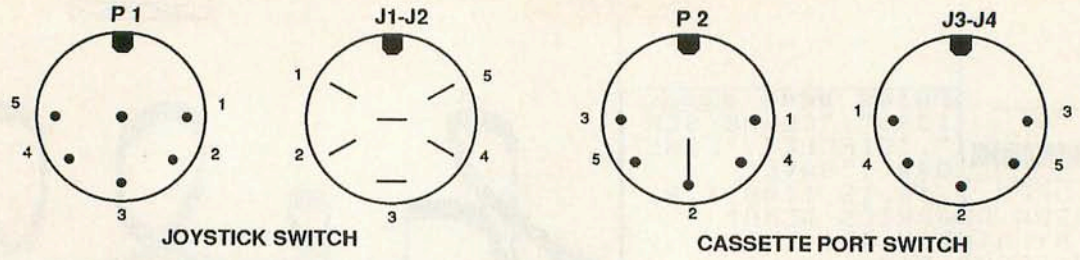


Figure 2: Plugs/Jacks Pinouts

stranded wires twisted together (preferably assorted colors), or use the wiring from an old, broken joystick. Prepare one 12-inch cable and two 6-inch cables by removing 1 inch of the outer jacket and stripping ¼-inch of insulation from each individual wire at both ends. Remove the covers from the jacks (J1,J2) and plug (P1), then solder these wires, one to each pin, as shown in Figure 2. Before replacing the covers, be sure to inspect the solder connections for shorts.

Insert the remaining ends of the wires into the three holes located on the left portion of the project box. The wires from J1 and J2 use the two holes at the rear of the box; the hole on the left side is for P1. Wire the switch (SW1) according to the schematic in Figure 3. Note that only two of these lines are switched: the +5V and ground lines. The others will be matched, soldered together and covered with electrical tape or shrink tubing.

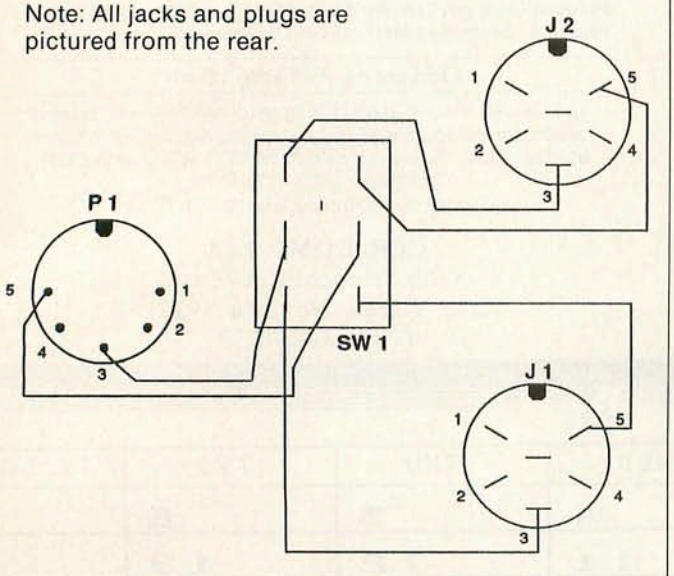
Switch 2-Cassette Port

Prepare three pieces of five-conductor cable: one 12 inches long, the others 6 inches long, as described previously. Remove the covers from the jacks (J3,J4) and plug (P2). Next, solder these wires as shown in Figure 2, one wire to each pin. Inspect the wiring for possible shorts before replacing the covers.

Insert the remaining ends of the wires on the right side of the project box. The hole on the right side of the box is for P2, the remaining two in the rear are for J3 and J4. Wire the switch (SW2) according to Figure 4. Notice that as in the joystick switch, only two lines are switched. The others will be matched together, soldered and covered with electrical tape or shrink tubing. Mount both S1 and S2 on the metal cover, aligning the handle with the marked switch positions.

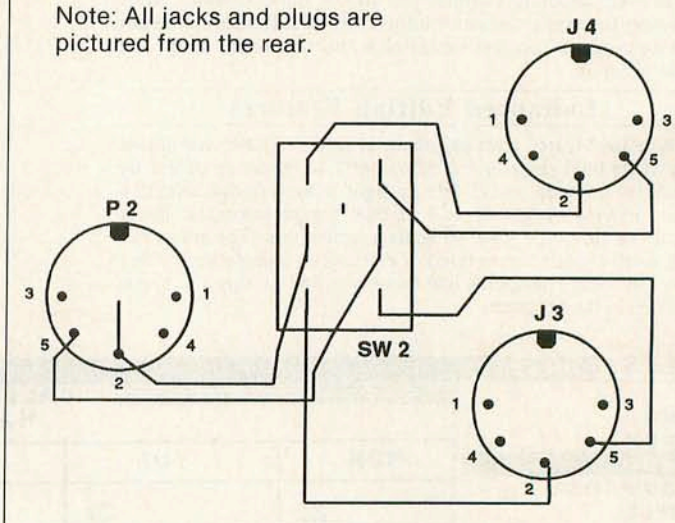
To secure the wires attached to the jacks and plugs, and to keep them from pulling out of the box, apply a small amount of epoxy to the point where these wires enter the inside of the box. Allow the epoxy to dry thoroughly before continuing.

Finally, reassemble the box, tucking the wires carefully



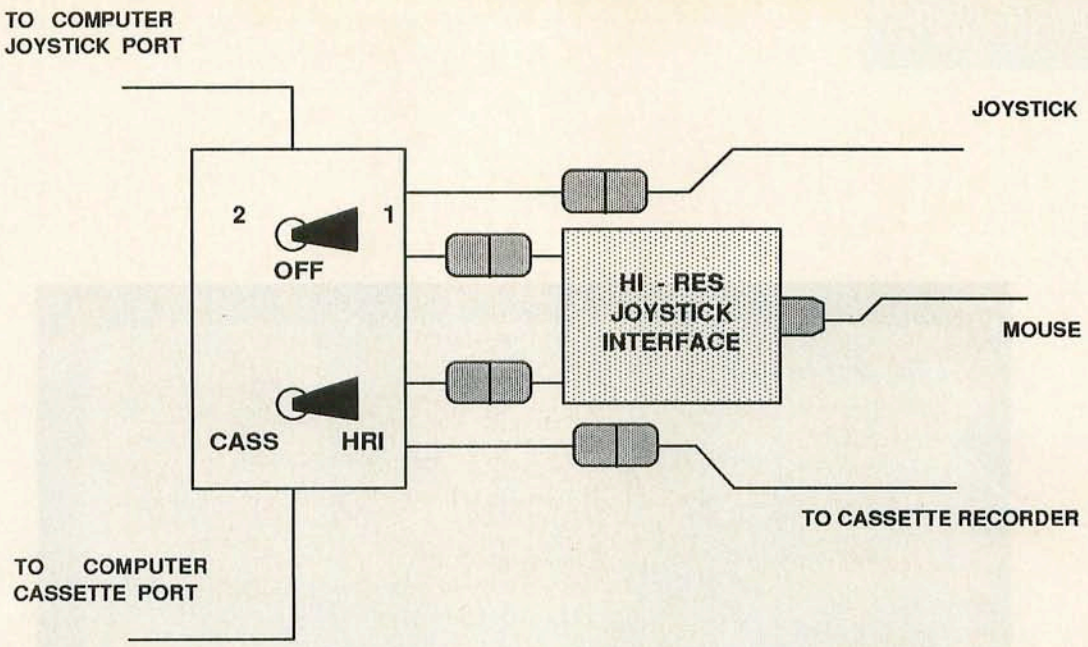
Match remaining wires from pins 1, 2 and 4 of J1, J2 and P1. Twist each group together. Solder and insulate with electrical tape or shrink tubing.

Figure 3: Joystick Port Connections

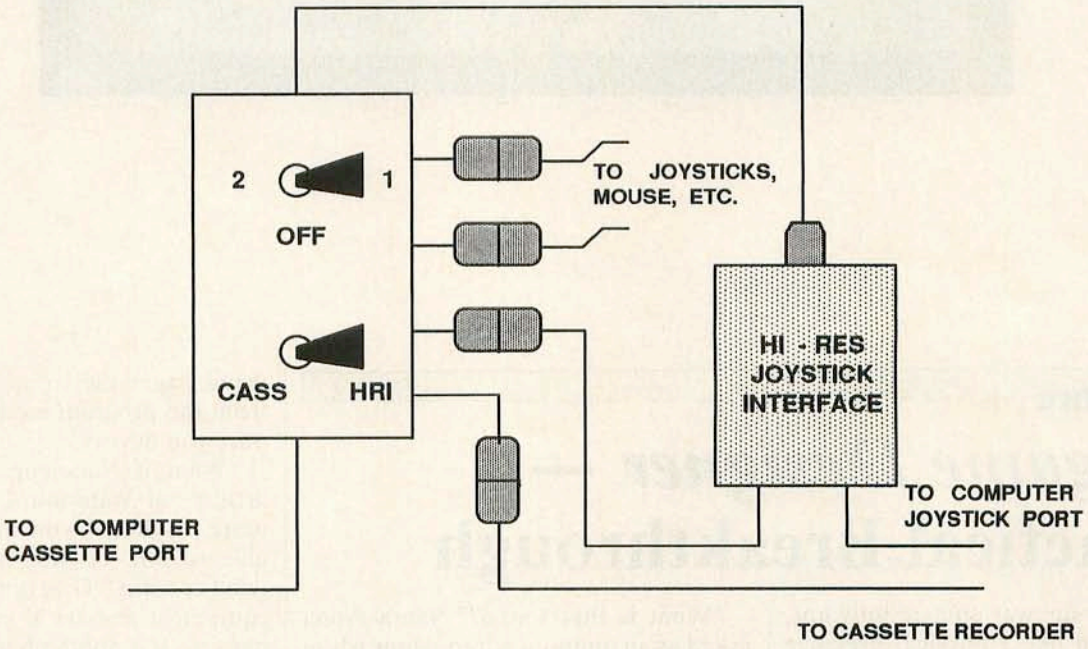


Match remaining wires from pins 1, 4 and 3 of J3, J4 and P2. Twist each group together. Solder and insulate with electrical tape or shrink tubing.

Figure 4: Cassette Port Connections



#1 - Switch between Hi-Res and regular positions for mouse and joystick. (Ex.: Use mouse for drawing tool, use joystick for games)



2 - Use both devices for HI-Res drawing. (Ex.: both mouse and joystick used for hi-res drawing tools)

Figure 5: Setup Diagrams

inside. As a finishing touch, cover the dry-transfer letters with clear nail polish to prevent them from rubbing off. To test it out, configure your Hi-Res Interface, cassette recorder and joysticks or other control devices as shown in Figure 5. Be sure to orient your accessories to match the marked switch positions. Now you can enjoy the convenience of switching both cassette and joystick ports without unplugging.

(Questions or comments about this hardware project may be directed to the author at 6835 Colleen Drive, Youngstown, OH 44512. Please enclose an SASE when writing for a reply.)

Software CoCo 3

Wargame Designer — A Tactical Breakthrough

The Texas sun was unmercifully hot, beating down like a physical presence on attacker and defender alike. Santa Anna's troops looked across the open area leading to the Alamo and swore; it looked so simple and yet the dusty ground was littered with their comrades' bodies.

The defenders peered wearily over the Alamo's walls, knowing they could not withstand another attack. Powder and shot were low, casualties were high. A collective sigh of resignation arose as they saw the Mexican troops begin to move forward one more time, most likely the last.

"What is that sound?" Santa Anna asked as an ominous whup-whup-whup filled the air, drowning out the thumping cannon and hissing rifle balls. His question was quickly answered as a troop of assault helicopters surged over the trees and began riddling his now-panicky troops with 2.75-inch rocket explosions and mini-gun bursts.

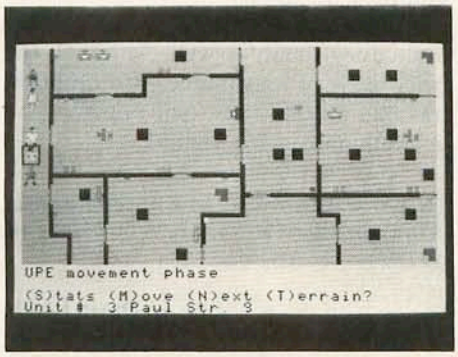
Science fiction? A movie with an exceptionally inept prop man? Every Texan's dream? Maybe. *Wargame Designer* from SPORTSware allows you to adjust the forces or terrain on the four provided scenarios, or design your own war game completely from scratch, using either the troop and map icons from the program modules or tailored ones you devise.

"What if Napoleon had had more artillery at Waterloo?" Give him some more. "What if von Paulus had been able to link up with von Manstein's relief column?" Give him the troops and equipment and see if you can make it happen. If it doesn't happen, subtract a Soviet corps or two and try it again.

You virtually have a free hand to design the war game you desire, adjusting the forces by type and strength as you like and drawing the map to suit your own ideas. As the rule book cautions, though, you should make the opposing forces relatively equal unless history demands otherwise; designing a game to commit slaughter is hardly fair, no matter what mission you remember.

This double-sided, two-disk set is designed specifically and only for the CoCo 3, using its 128K and advanced

graphics capabilities to the fullest. The first question after loading is whether you have a composite or RGB monitor; the graphics look *ever* so much better on an RGB.



Since I have only a color TV, I wandered up to my local Radio Shack and asked to use one of their CoCo 3s hooked up to an RGB. Friendly and helpful people that they are, I was given free rein. Dave the salesman hung around to watch and was as impressed with the graphics as myself. While good enough on a TV set, they're truly spectacular on an RGB, and can be enhanced even further by the PALETTE command built into the system, allowing you to choose from among 64 colors.

The 23-page instruction/rule book comes in a folding plastic case along with two disks that are ready to be backed up. The instructions in fact suggest it. You'll have to do it anyway to design your own war games.

SPORTSware: Designer's Designers

SPORTSware, an 8-year-old, Toledo family-owned software company, stresses the word *strategy* in most of its products, being primarily interested in the strategic aspects of sports, science fiction, adventure and wars.

After designing a laserdisc football strategy game called *Live Action Football* (endorsed by the NFL) for arcades, they turned their talents to the CoCo. Their *Football Strategy* software was the arcade game without the laserdisc footage. Currently available software consists of *Gridiron Strategy* and *Weekly Winner* (for choosing lottery numbers), plus several separate war game scenarios not requiring *Wargame Designer* (*WGD*) to run.

Paul Olmstead programmed *WGD* specifically for the CoCo 3, inspired by its capabilities and some things he said he found unsatisfying about many current computerized war games: "Once you had played it through, there wasn't much else you could do with it; the graphics weren't appealing; many were for only one player and scenarios couldn't be changed." (He might also have added the lack of a game-saving option.) He stays with the CoCo 3 for the company's programs, feeling that every CoCo owner's secret desire is to own a CoCo 3.

A wargamer himself, Olmstead stated that he might have been one of the first people in the country to buy *Tactics* in 1964. Two years later, he was officially invited to participate in what has sometimes euphemistically been called the "Southeast Asia War Games." Instead, he enlisted, went to Officer Candidate School, served on the XVIII Airborne Corps' Commanding General's staff and found himself in Vietnam in 1968.

When asked about current projects, he obviously remembered his security clearance, responding, "We're not telling." Military and business experience taught him that you don't let the enemy or the competition know what you're doing until you've done it.

As a family businessman, Olmstead says that he relies a lot on his wife, Kathy, and daughter, Ashley, for support and understanding. The suspicion arises that the distaff side of the family may be the most severe and critical playtesters he has found. From my own experience, if I can get a new magic trick past my wife, it'll get by anybody.

SPORTSware encourages *WGD* owners to submit new scenarios for possible future use. Olmstead recently received a letter from a gentleman in Quebec who plans to create some additional *WGD* scenarios for his history classes and then share them with SPORTSware.

Considering the rampant imagination of CoCo owners, SPORTSware could become deluged with suggested battles, historical and speculative. Although nobody at the company has yet read *Red Storm Rising*, they might have to in order to understand some of the letters. □

War Games as History, or Vice Versa

Nobody knows for sure when commanders first began playing "What if?" games, trying to figure out what to do if their opponent did this or that. However, Wellington's remark "The Battle of Waterloo was won on the playing fields of Eton" could well have referred to a war game of some sort.

As weaponry becomes more precise and lethal, so must war games become more complex — which may explain why war games dealing with Napoleonic times may be the most popular: The weapons were sufficiently advanced to prevent all but the most inept commander from moving his forces in a single mass, yet uncomplicated enough to allow the rules to be relatively easy.

The first professional war game may have been *Kriegspiel*, developed by the Prussian general staff and perhaps partially responsible for their victory in the Franco-Prussian War. H.G. Wells (yes, that one) is credited with inventing the first war game for amateurs — *Little Wars*, which used model soldiers.

We've come a long way since then: Modern military services use computers and other exotic devices to simulate the forces opposing each other. Artillery, air strikes and the like are still important but are complicated by acronyms such as EMP, EW, FLOT, ECM, ECCM, ASW and ALOC. All of these Simulations are designed to train the staff, test the current plans and inject just the right amount of confusion and lack of information to make it seem real.

Bookshelves and toy stores are filled with war games ranging from Greek Hoplites to 21st century space marines, all for us amateurs. Many of them become quite confusing in their complexity caused by the quest for realism. Computerized games are much easier; the "commanders" make the decisions, the computer figures the results.

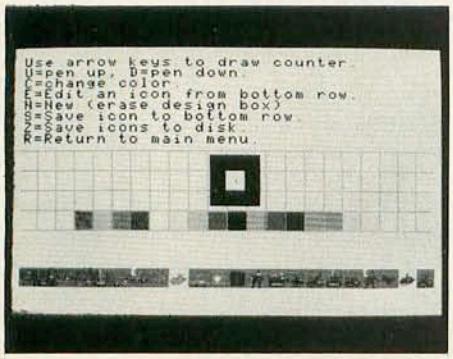
One vital point to remember, for both professional and amateur wargamers: Learn from the game and try not to repeat the dumb mistakes. A story has it that the Japanese naval staff war gamed an attack on Midway. The players portraying the Americans caught the other players while they were refueling and rearming their carrier planes, sinking two carriers. The chief umpire would have no part of that, since that might lead to an imperial defeat, and allowed only one carrier sunk.

A few years later, the same basic thing happened, this time for real. Many historians consider the Battle of Midway the turning point in the Pacific.

Did the U.S. Navy war game that one in advance? □

The system consists of five modules: unit icon design, map icon design, map design, unit attributes and the game module. The instructions walk you carefully through each of the first four modules, so it's almost impossible to mess it up if English is your primary language. However, when you design your own war game, make absolutely sure that you assign objectives for each army, man them and assign a Terrain Modifier of 8 to at least the Red army's town or fortress, even if you're re-enacting the Battle of Cannae as I was. Without objectives, the program checks to see if the Red forces occupy any objectives; finding none, it automatically declares the Blue forces the winner. This can be disconcerting when you've spent some time setting up the Order of Battle for each army and reviewed your notes on Hannibal. You can, by the way, design either one- or two-player war games; equally important is the capability to save a game in progress.

If you don't want to design your own from scratch, you can adjust various things on the four different games on the disks: Invasion North, Attack on Moscow, Robot Command and Dungeon Warrior. (These in themselves seem to be worth the price.) For example, you can change terrain features on the map, adjust movement points needed to cross terrain features, have reinforcements arrive earlier or later, and make a unit stronger or weaker. In addition, the entire thing is written in BASIC, so the hackers can play with that aspect also.



My only suggestion would be to install a default value when assigning movement costs and combat modifiers; you could then use the cursor to take care of the exceptions.

The scenarios provided aren't that easy, either. After slashing my way through the border defenses in Attack on Moscow (and feeling pretty smug about it, too), my troops started getting fire from the Soviet Katyusha rocket launchers. This continued all the way to the Moscow suburbs, where my last bedraggled infantry unit perished under a rain of rockets.

The programs take up all but five granules on a disk, so you'll need to use a separate disk side for each game you design or modify. Difficult games can either be altered further or reformatted, backed up from the master copy and begun again. The only real limitation is your imagination.

In short, fanatical wargamers who have been waiting to fight some obscure battle from the War of the Roses don't have to wait any longer. Drag out the history books, lock and load a disk into your trusty CoCo 3 and have at it!

(SPORTSware, 1251 S. Reynolds Road, Suite 414, Toledo, OH 43615, 419-389-1515; $29)

— John M. Hebert

Software CoCo 1, 2 & 3

Fraze Craze — Wheel-Watching on the CoCo

Fraze Craze, a fun-to-play word game similar to the popular *Wheel Of Fortune* TV game show, was written for the 64K CoCo 1 or 2 but also works on the CoCo 3.

Fraze Craze is supplied on an unprotected disk, so a backup copy for your own protection is not a problem. The program is written in BASIC, and the instruction booklet contains directions on adding your own custom game data covering people, places, things and events.

The right joystick is used to move the onscreen cursor left or right to select the letter of your choice. When you press the firebutton, the "spinner" is activated; a highlighted cursor moves from left to right across the screen and stops on a number. This number represents the dollar amount to be played on a particular turn and will be multiplied by the number of correct letters that show up when you make your guess.

Just like on the TV show, you can also buy vowels; but because the game is written for one player, you compete with five "men." If you choose a letter that is not in the phrase, you lose one man — you will also lose one man if the built-in timer counts down to zero before you select a letter.

Letters are blocked out after each choice, so you can keep track of the ones already used. As soon as you think you know the answer to the puzzle, you can select the question mark and then type in the answer. If you are correct, you win the round and go on to a new puzzle; otherwise, you lose two men and continue the game.

I liked *Fraze Craze*. It's fun to play and educational, as well. Although the price is very reasonable, the program has one glaring flaw. Not once do you get a chance to see Vanna!

(RAM Electronics, 814 Josephine St., Monmouth, OR 97361, 503-838-4144; $12.95)

— David Gerald

~~Software~~ CoCo 1, 2 & 3
~~Hardware~~

Syntrax 2.0 — CoCo MIDI Package

There you are, a record producer, sweating bullets, surrounded by millions of dollars of electronic recording gear at a major recording studio. The equipment and musicians are costing you hundreds of dollars per hour. Your master tape must be mixed and ready to go tomorrow and the client is there breathing down your back and even more nervous than you are. (No wonder. By the time it's all done, you may have spent over $25,000 of the client's money recording the album!)

Suppose, in the middle of the session, I stopped you and said, "Hold on. Relax. I can get you the same quality product for the cost of a CoCo, a few synthesizers and *Syntrax* 2.0 from Intercomp Sound. You'll save hours in costly studio time, and have more control at every step of the production."

You'd probably make an appointment with me first thing the next morning, wouldn't you?

I know just what I'm talking about, because I have had my own copy of *Syntrax* for a couple of years, and it has already saved me thousands of dollars in recording costs. (I am a pianist/synthesist/producer and have just finished producing one album in Nashville. I own five synthesizers, two MIDI-capable digital reverberation units, a drum machine and — of course — several CoCos.)

If you don't know what a MIDI synthesizer is, here is a brief explanation. (For more details, go to your local *professional* music store and ask for a demonstration of MIDI.)

MIDI is short for Musical Instrument Digital Interface and refers to a standard format for data transfer between electronic synthesizers. The data includes information such as how quickly a key on a synth was depressed, which note it was, how long it was held down, and so on.

MIDI's capability to quickly transmit the status of electronic devices (of which synths are only one example) is making it a de facto standard for the electronics-dependent recording industry. MIDI is such a developed protocol that it allows the musical imagination to go into territory unimagined just a few years ago.

Syntrax arrives with a thick manual and software. However, it requires the Color MIDI Connection, a hardware MIDI interface that connects between the computer and the disk controller. An extender ribbon connector is part of the interface, so I recommend a Multi-Pak to reduce those occasional I/O errors.

You install *Syntrax* by turning off your system and attaching the Color MIDI Connection. Then you attach your MIDI cables from the CMC to your synth, power up and type `RUN "SYNTRAX"`.

The Channel mode prompt (`CH>`) flashes, waiting for commands; a sophisticated parsing routine interprets them. All available commands are presented onscreen.

Let's run through a sample session. Suppose we want to create a music file with the built-in editor. This uses the Insert mode, so we press I.

The screen clears, leaving us with the Channel mode prompt and a line number. At the cursor we type our musical data in letter form. Using the usual RS-DOS SHIFT-0 combination as necessary, we enter the following: `CH> 1 c:d:e:f:g:a:b:C:D:E:F:G:A:B`. This is two octaves of a C major scale.

Why do we mix uppercase and lowercase? *Syntrax* starts out with a default two-octave range, with the lower octave being represented by CoCo lowercase (reverse video) letters, and the upper octave with uppercase. Also, the default note duration is a quarter note. Notes are separated by a colon.

When you press ENTER, *Syntrax* compiles your text into MIDI data (compilation is incredibly fast), and you are brought automatically to the Play menu. Begin to play the line above by pressing B for Begin, and *voila*! Your MIDI keyboard plays what you typed! To continue with the rest of a composition, you simply add more text lines with the editor, compile them, and play them back to check them one at a time.

That was easy. What else is there? Flats and sharps are handled easily. Simply use the plus sign (+) for sharps and the minus sign or hypen (-) for flats. One way to write an E-flat major scale would be `CH> 1 e-:f:g:a-:b-:C :D:E-`. The notation may seem hard to master, but it isn't — I got accustomed to the system in minutes.

Chords are easy, too. For a C major chord (which has the notes C, E and G), simply type `CH> 1 cmaj`. And for minor, type `cmin`. Diminished chords and chords with sevenths are implemented, too.

You can also specify each note in a chord, for that special voicing or for that "weird" sound not covered by usual chord notation. To make the notes sound simultaneously, don't separate

them with colons: `CH> 1 d e- g- b- F`.

Duration of the notes can be manipulated, too. Here is a funk bass line in *Syntrax* notation:

```
CH> 1 ? r/16:d-:e-:r/8:d-
/16:r:e-:r:d-:e-/8:c--
```

Rests are denoted by `r` and the duration of a note is specified by a slash followed by the duration required. In the example above, `r/16` means a 16th-note rest, `e-/8` means an E-flat in the bass clef for an eighth note duration. If no duration is specified, the previous duration is implied.

Several lines of this kind of text, when listed to the screen or printer, can be difficult to interpret months (even hours) later. Luckily, *Syntrax* allows you to fully comment your data. Simply type in a line of music, type a semicolon to signal that what follows is a comment, and then enter your comment. For example:

```
CH> 1 & D-maj E-/1:E-maj
F/1; Rhodes chords, measures 1
and two
```

The compiling step, initiated with ENTER, will ignore all text followed by the semicolon. Note that the question mark (?) and the ampersand (&) denote bass and treble clef, respectively.

Other features of *Syntrax* Channel mode insertion include transposing by any number of half-steps; sending out specific MIDI bytes such as program change, attack velocity, pitch-bend, and MIDI channel data; easy implementation of repeats, even with nested repeats; memory conservation by chaining to other files.

After you have entered a file, you will want to hear it. Go to the Play menu (from the main menu), where you can choose to begin playing (B), to stop play in the middle (S) or to continue playing (C). You can fast forward with the clever view feature (V) and you can interactively change the tempo during playback with the tempo option (T).

Is that all for the Play menu? Hardly.

Play's "More" option (M) brings up a whole new screen, which allows you to do the following: choose your synchronization source, either the computer itself or an external sync device, such as another sequencer or a drum machine; send out a MIDI "tune" command to all your synths to make sure they all tune their internal oscillators, a great feature for initializing an extensive MIDI setup "at the gig"; select your clock resolution (24, 48 or 96 pulses per quarter note); choose to display note names as the sequence is playing; "mute" (de-select) any of the Channel files you have created (essential for recording studio applications).

The Channel files you create are combined to play simultaneously. But when I go into the studio, I don't want all the files to play at once. I typically record my music one track at a time with only one synth, so I need to mute all parts but the one I am currently recording.

Are you starting to get the feeling that *Syntrax* 2.0 is feature-packed? Believe me, it is.

In addition to the Channel mode, *Syntrax* offers System mode. You change to System mode after saving your Channel mode files to disk (which *Syntrax* reminds you to do with an "Are You Sure?" message).

In System mode, you assemble individual Channel mode files into a System mode file. This System mode file specifies the Channel mode files you want to include, determines the tempo and any tempo changes within the song if necessary (called "Global Track"), and provides access to a Play menu similar to that available in Channel mode.

In addition to using the Channel mode editor to input notes, *Syntrax* offers two more input methods, Step-Time Recording and Real-Time Recording.

Step-Time Recording allows the user to hook up his or her MIDI-equipped synth to the MIDI-In port of the Color MIDI Connection and insert (I) notes from the synth keyboard instead of

from the CoCo keyboard. First, tell *Syntrax* that your synth is on from the main menu. Next, choose Insert. Instead of being brought to the Channel mode editor, you are now in a new screen full of a host of new options. Just start playing, and your notes will go into the buffer. Durations are not recorded, but are easily added by tapping the space bar.

Step-Time Recording mode offers several crucial editing functions, which may either be activated by the CoCo or assigned to several "spare" notes of your synth keyboard. Activating editing from your synth allows you to spend less time going back and forth between synth and CoCo.

Step-Time Recording provides the ability to do the following:

- alter note durations
- loop playback so you can hear your sequence over and over
- enable and disable triplet note duration
- interactively change playback tempo
- fast-forward and rewind through your sequence
- switch over to Real-Time Recording.

Real-Time Recording is the final input mode offered by *Syntrax* and is particularly useful for more capable keyboard players. Real-Time Recording records notes *and* their durations.

Let's take a quick look. Real-Time Recording provides a great built-in metronome and quantization. Quantization is like the grade-school process of rounding off fractions to whole numbers, except you are rounding off your sloppy playing to the nearest 16th note or eighth note, or whatever unit you need to clean up the slop.

A song-position pointer is also implemented. MIDI pros will be glad for this, as SPP allows the CoCo and a drum machine to keep tabs on each other's place in a composition.

This is only an overview of the structure and sense of operation of *Syntrax*. There are dozens more features, including some not documented (like MIDI delay and track-shifting for that really relaxed drum feel) and some rather esoteric (like telecommunicating sequences and controlling light rigs with MIDI signals).

It might be best to conclude with my overall impression of the product from the professional point of view.

Syntrax provides an easy way to get at the "byte level" of MIDI data. It is so memory-efficient that I will eat my hat if you can compose a piece with it and use up the memory. The drum machine interface is the most reliable of any MIDI program for the CoCo. The manual is complete. *Syntrax* is fairly easy to learn; the more you know about music, the better. It has never failed me in the studio.

Syntrax, for now, is my MIDI sequencer of choice for the Color Computer. However, it lacks chiefly in two areas.

One, the user interface, while well-designed, has problems. Channel mode is somewhat like programming in BASIC at times. Input from the Real-Time mode needs the ability to record polyphonically. And the program *never* shows a musical staff. This is enough to make educators balk at using this otherwise powerful tool. Many musicians, too, would rather see a staff than be caught dead learning "programming."

Two, the manual — which comes well-bound and professional-looking — does not read as professionally as the program operates. It is largely complete, but not entirely clear and contains a few grammatical errors.

But these are small criticisms. The manual is improving with each revision, and there are other enhancements, too, including changes to the Color MIDI Connection that make it safer to add and remove MIDI cables while powered up.

Syntrax 2.0 provides features not found in many — if not most — other MIDI software packages. (In fact, I know no other RS-DOS program of *any* kind that offers more features.) And I hear the folks at Intercomp Sound are

working on a CoCo 3 version that will knock our socks off.

All in all, I would say that *Syntrax 2.0* is the one to buy if you plan on getting into professional performance and recording. If you have a CoCo 3, however, I suggest you wait until the guys at Intercomp get the new *Syntrax* out.

(Intercomp Sound, 129 Loyalist Ave., Rochester, NY 14624, 716-247-8056; *Syntrax*, $95; Color MIDI Connection, $98: First product review for this company appearing in THE RAINBOW.)

— Paul Ward

Software

Flight Simulator II — Realistic Flight Simulator for the CoCo 3

If you enjoy flying, either as pilot or passenger, you will like this entry into the CoCo 3 market from SubLOGIC Corporation — *Flight Simulator II*, or *CC-FS2*, which simulates the instruments and flight characteristics of a Piper P-28-181 Archer II.

The program, written in OS-9 Level II, boots using the familiar DOS command with RS-DOS 2.1 or later. If you have an earlier version of RS-DOS, a short program is provided in the documentation to allow you to boot the program from BASIC.

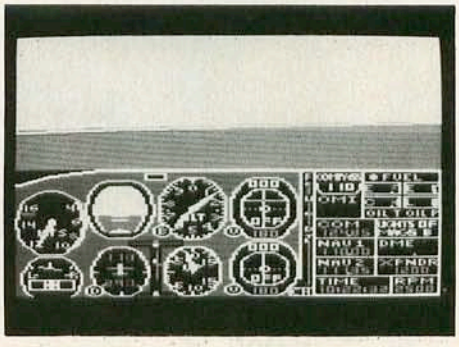
The Piper Archer II is a single-engine, 148 mph, non-retractable gear aircraft equipped with a good set of avionics. The author chose to simulate the Archer II because of its overall good performance, simplicity and ease of flying.

This simulator is well-packaged and is sure to catch your eye on your dealer's shelf. The package consists of a single non-protected disk and flight maps of the Los Angeles, Chicago, New York, Boston and Seattle areas. Also included are two soft-cover books: *Pilot's Operating Handbook and Airplane Flight Manual*, which will help you figure out how to fly the simulator; and *Flight Physics & Aircraft Control*, a 92-page, informative mini-manual that explains the dynamics of flight and aircraft control. Inside *Pilot's Operating Handbook* is a handy "Flight Reference Card" that shows at a glance the keys that control the aircraft's elevators, throttle, trim, rudder and brakes. It also provides information on selecting views out of the cabin window. You will find yourself using this card frequently.

Although the graphics look best on an RGB monitor, provisions are made to run the program on both composite monitors and TV sets. I used the keyboard to control the program, although joysticks can be used. The *CC-FS2* disk contains a war game and several scenery files for the Chicago, Los Angeles, New York and Seattle areas.

A "Quick Test-Flight" mode is available and will allow you to start flying as soon as you boot the program. I preferred to watch the demo mode for a while to get a feel for what was out there and to see the controls operating. The screen is split horizontally. The top part of the screen displays what you, the pilot, see when you look out the window. This view is adjustable for side, back and forward views.

The bottom part of the screen displays the instrument panel, which is really "loaded." Space does not allow me to detail each and every control, knob, indicator, etc. But suffice it to say that the panel is jam-packed with such items as an airspeed indicator, altitude indicator (horizon), altimeter, heading, trim, stall warning, elevator, rudder and flap position. Also monitored is oil pressure, fuel, the magneto, COM and NAV radios, tachometer, carb heat, omni bearing, course deviation and glide slope.



One or two joysticks can be used to control flight. The left joystick controls the aileron in the left-right direction and the elevator in the forward-back direction. The button is used to select the cabin view. The right joystick, if used, controls the flaps in the left-right direction and the throttle in the forward-back direction. The right joystick button controls the brakes while on the ground and guns while in the War Game mode. If you don't have joysticks or don't want to use them, you can still fly with *CC-FS2*.

Clusters of keys on the CoCo's keyboard are used for the various phases of flight control. For example, the ailerons are controlled with the F, G and H keys, representing the left, center and right ailerons. The elevators are controlled with the T key (down) and the B key (up). Elevator trim and flaps are similarly controlled. The rudder moves from left to right using the C and M keys, and your brakes are activated by the space bar.

Although *CC-FS2* is easy to fly, I found the hard part to be in the landing. In fact, flying was all I accomplished during this review. After several crashes, I concluded that I wasn't cut out to be a pilot anyway. I was able to "buzz" the Sears Tower in Chicago a couple of times. The realism is really apparent to you when you fly low and change the view out the window as you pass buildings, mountains, etc. The colors are great, but the motion, while a little jerky, is no worse than that found on the IBM version of *Flight Simulator*. In fact, the program looks a whole lot like the IBM product to me.

The author of the program, Bruce Artwick, has done an excellent job in adding realism to *CC-FS2*. Everything from cloud formations, night flying (dark outside with instrument lights only) and wind are user-controlled from a setup screen activated by the F1 key. You can even fly on instruments if you are so inclined.

The War Game option is a lot of fun, too. You will see the gun site in front of you as you take off and declare war on the enemy. Be prepared for some dogfighting fun as you shoot your dual machine guns and drop bombs on enemy territory.

Flight Simulator II is a fine program for the CoCo 3. Not only does it provide some serious diversion from the usual game fare, but it challenges and educates, as well. I recommend *CC-FS2* for your CoCo 3. Whether you are a pilot or just interested in flying, *CC-FS2* will give you the chance to fly without suffering some serious consequences.

(SubLOGIC Corporation, 713 Edgebrook Drive, Champaign, IL 61820, 217-359-8482; $24.95: Available in Radio Shack stores nationwide.)

— Jerry Semones

Software CoCo 1, 2 & 3

Mini Database — A 32K Database for Little Lists

While more and more of what I consider "serious software" is becoming available for our powerful Color Computer, I am glad to see companies bringing out good productive software for those people and purposes that do not require complicated and expensive software. *Mini Database* by Tothian Software is such a program. It is not a large and full-featured database program, yet that is not what it is supposed to be. It is what its name implies — a 32K mini database. It will handle a lot of the jobs most people use an expensive database for, and it does it very well.

If you have jobs that honestly do not require the special abilities of an expensive database program, but do require some data manipulation, you may be looking for a program just like *Mini Database*. It allows you to create files for friends or club members, addresses, phone numbers, home inventory, maintenance schedules, collections, etc.

Mini Database is available on both disk and cassette. If you purchase the tape version, you'll still be able to use the program when you upgrade to disk. The program is written in BASIC, which gives it some distinct advantages.

Once the program is loaded and run you are guided by very simple menus. The program is very user-friendly, but it is not "idiot proof." Being written in BASIC helps, though. For example, you can accidentally exit the program without saving your data (there is no "Are you sure?" feature), but this is no problem in BASIC — all of your data is still in memory; just typing GOTO 7000 gets you back to the main menu with all your data intact. If you accidentally press the BREAK key, typing CONT or the GOTO statement will get you to the main menu.

The program does not check for memory area. If you try to create a database too large, you will get an OM Error. This just means you will have to create a number of smaller databases or revise the original. I am not pointing these things out because I think they are problems, I am pointing them out because they are easy to get around with a little thinking. Being written in BASIC makes the program easy to recover from mistakes.

BASIC also makes *Mini Database* compatible with all three CoCos. I am very impressed with a company that keeps coming out with inexpensive, easily expandable software the average CoCo owner can buy for small jobs. Do people really *need* a database program that is going to run anywhere from $80 to $250 just to keep track of club mailing lists? I believe there is a lot of work out there that can be done very well with smaller, less complicated programs. You may even find *Mini Database* a whole lot easier to use than the expensive database programs that do all those things you don't really care about, anyway.

(Tothian Software Inc., Box 663 Rimersburg, PA 16248; $14.95)

— Dale Shell

Software CoCo 3

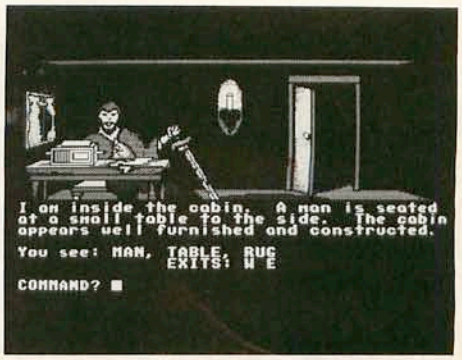
In Quest of the Star Lord — Seeking the Phoenix Crossbow

As the son of an internationally famous scientist, you have been imprisoned in a research work camp following a 12-year interworld war. Your father, who was killed during the war, had provided you with a scientific education and a bright future. In your research you come across passages referring to the prewar empire of the Star Lord and his ultimate weapon — the Phoenix Crossbow. You decide to escape from your prison and search for the Phoenix Crossbow. You know that if you find it, your freedom will be ensured forever.

In Quest of the Star Lord is an animated action Adventure written for the CoCo 3 and one disk drive. The package includes two flippy disks so that the Adventure will fit on two disks rather than four. The graphics are superior and without a doubt the best I've seen to date on the CoCo 3; the 320-by-200 resolution is razor-sharp on my Tandy CM-8 RGB monitor. The program works on composite color monitors and TV sets, as well.

The program is copy-protected and warranted for one year, and will be replaced during that period free of charge if needed.

Starting the Adventure is as simple as typing LOADM "BOOT" and pressing ENTER. After selecting monitor type, a colorful and rather dramatic title screen appears, complete with flashing lightning and a musical interlude.



The program responds to standard two-word commands at the prompt. These commands must consist of a verb followed by a noun — GET ROCK, for example. Abbreviations are also accepted, such as I instead of INVENTORY. Also, as is customary, direction is controlled by commands such as GO NORTH, or simply N. If you are serious about solving this Adventure, it's wise to make a map of your travels.

The ability to save your progress is provided so that you don't have to keep repeating each command as you move on to different locations and screens. Simply typing SAVE and pressing ENTER provides a prompt that allows you to save your last six attempts.

I found *In Quest of the Star Lord* extremely challenging and fun to play. Whenever I get a chance to review graphics Adventure games, my 11-year-old daughter sits for hours fascinated with the endless possibilities and often surprising results. The two of us working together have made a lot of progress in this Adventure, but at the time of this writing have not even come close to the solution. As with most Adventures, part of the fun is trying to figure out the right commands. We found that while seemingly simple commands are often appropriate, it sometimes takes a while to come up with them.

The animation often manifests itself in the form of moving cloud formations, lightning and flashing lights. The use of shadows provides a realistic and often striking effect — you have to see it to believe it is being generated on your little old CoCo 3.

In my opinion, *In Quest of the Star Lord* is quite simply a dynamite program. It's not a fast-paced game by any stretch of the imagination, but rather a

strategy-filled exercise sure to provide hours of excitement and enjoyment.

(Sundog Systems, 21 Edinburg Drive, Pittsburgh, PA 15235, 412-372-5674; $34.95 plus $2.50 S/H)

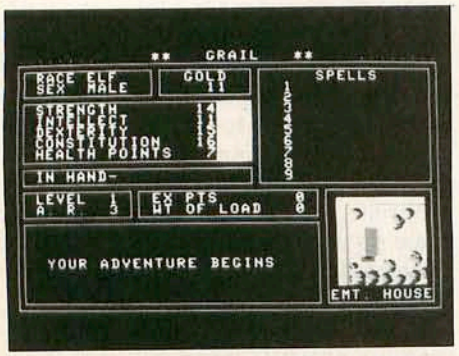
— Robert Gray

Software CoCo 3

Power Stones of Ard — The Quest for the Spirit Stone

The popular "dungeons and dragons" type games lend themselves particularly well to the computer. And since the first home computers began to gain in popularity, this type of game has amassed a large and loyal following. Three C's *Power Stones of Ard* now brings the challenge of swords and sorcery to CoCo 3 users.

Millenia ago, when the forces of Good and Evil battled each other for control of the world, three magical stones were created. Among them, they contained all the magic and power of the forces of Good. Alas, they were stolen by the Evil Ones, and now each is protected in a separate fortified stronghold — tempting treasure for a resourceful Adventurer. This is where you come in! You must try to find that particular stone called the "Spirit Stone" and take it away from the Evil Ones. . . .



Bill Cleveland, the program's author, has created an attractive screen to display all the necessary status reports (wealth, character information, etc.) for game play. The lower-right section of the screen is used for scrolling graphics scenes, featuring overhead views of the traveler's locale; these are attractively done and well-executed.

At start-up, the user can elect to create a character, load a previously created one or opt to use the default character. The traits of strength, intellect, dexterity and constitution are user-definable. Based on the character selected, the computer then generates starting amounts of gold and health points (necessary for success).

Most commands are performed by a single key press. Movement about the world is accomplished by use of the arrow keys. Other examples are <A>ttack, <B>uy, <G>et, etc. Use of the CTRL key and function keys is supported.

I found the game both fun and challenging enough to provide hours of entertainment. The program comes on a single unprotected disk for user convenience. A booklet contains loading instructions, documentation for all commands and a handy quick-reference guide. Another plus for the program is price. *Power Stones of Ard* should find its way into many CoCo 3 software collections.

(Three C's Projects, P.O. Box 1323, Hamlet, NC 28345, 919-582-5121; $18)

— Leonard Hyre

Software CoCo 3

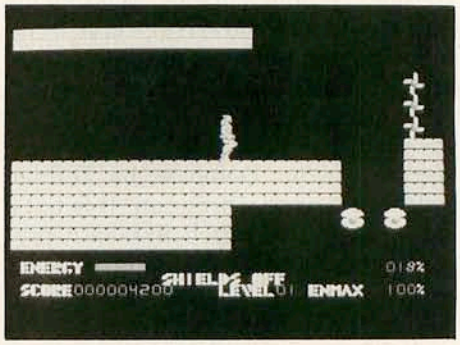
Thexder — From the Folks Who Brought You GoBots

Americans seem to have a love affair with things "Made in Japan." Toyota cars arrive by the boatload; Noritake dinnerware graces the table of many a U.S. household; Panasonic consumer electronics of all kinds are sold in ever-increasing numbers. Americans are even developing a taste for thinly sliced raw fish served on rice.

With the exception of the *sashimi*, these products have earned their niche in the marketplace due to their high quality and reasonable prices.

Now another Japanese import is claiming our attention — *Thexder* has arrived. What is *Thexder*? Well, it's a "robot" that comes to you via the very American computer company in Coarsegold, California — Sierra On-Line.

The *Thexder* "Super Assault Vehicle" is supplied on a ROM pack and comes alive with a little help from your CoCo 3. In the game, you are the pilot of the *Thexder* Super Assault Vehicle. Your mission is to destroy the central computer, which creates evil creatures and turns them loose on the world.



As you proceed, you are faced with various challenges. There are more than 20 types of aliens to do battle with, and the game gets more difficult the further you advance. Caves, vast cargo holds and spaceship interiors are all turned into battlefields.

A variety of armament and shields are available to assist *Thexder*, including a very unique ability — *Thexder* can change from a robot to a jet fighter. Yes, just like on the *Go Bot* TV show, you can "transform" back and forth at the touch of a button.

Unlike simpler arcade games, *Thexder* uses multiple screens, music and excellent animation. Shields, differing energy levels, hidden traps and a seemingly endless variety of scenarios all combine to make this a game you will be drawn to. Like the more familiar Sierra Adventure-type games, *Thexder* gives you a lot of play time for your money.

How good is *Thexder*? Well, it's the best-selling arcade game in Japan. Over 500,000 units have been sold there. While arcade games are passé here, the fury continues in Japan. To be the best in Japan, an arcade game has to be very good. And *Thexder* is!

Thexder sends you on a perilous journey. But if you have a CoCo 3, it's quite a trip.

(Sierra On-Line, Inc., Coarsegold, CA 93614; $24.95: Available in Radio Shack stores nationwide.)

— Bruce Rothermel

RS-232 Switcher — Making the Connections

A new vendor in the CoCo market, Radcomp is making its presence known by offering quality construction at a very reasonable price.

The product in question is an RS-232 switch. While the unit I received was of the two-position variety, a more useful three-position switch is also available. Both switches are offered for retail sale at approximately one-third the usual cost for such devices.

A top-mounted two- or three-position rotary switch indicates which port is currently active. Input is via a standard male CoCo four-pin serial connector attached to a 2-foot length of cable. Two (or three) female serial outputs, which are mounted along the 4-inch length of the case, complete the assembly. Overall finish and construction are excellent, and the unit should provide reliable, trouble-free service.

If you are an old hand at plumbing countless devices into your CoCo, no doubt you already own one, if not several, RS-232 switching devices. On the other hand, if you are new to the world of CoCo computing, you will very soon encounter the need for multiple RS-232 connections. While a switching device can't provide you with multiple active inputs, it does away with the never-ending cable swapping that accompanies the single-port, multiple accessory setup that most of us eventually construct.

Incredibly, this simple product is accompanied by four pages of installation instruction, and includes several paragraphs on hints and operation — all this for a simple switch. While I feel that documentation is absolutely essential, this effort probably constitutes a bit of overkill.

Radcomp obviously has our best interests at heart, as evidenced by a 30-day, money-back guarantee and the inclusion of a lifetime warranty on their products, and that commitment is acknowledged. But I would suggest the people at Radcomp retain a bit more profit from their enterprise by curtailing (excessive) printing expenses and devote the difference to additional product offerings. The CoCo Community always welcomes quality. Welcome aboard, Radcomp!

(Radcomp Computers, 1865 E. Broadway #420, Tempe, AZ 85282, 602-894-6489; two-way Switcher, $10; three-way Switcher, $11.50: First product review for this company appearing in THE RAINBOW.)

— Henry Holzgrefe

Received and Certified

The following products have recently been received by THE RAINBOW, examined by our magazine staff and issued the Rainbow Seal of Certification, *your assurance that we have seen the product and have ascertained that it is what it purports to be.*

EZGen, a disk-based boot editor for OS-9 that allows OS-9 programmers to edit OS-9 modules or data blocks contained in a specified file. For all CoCos and OS-9 Level I or II; 512K required on the CoCo 3 for OS-9 Level II. *Burke & Burke, P.O. Box 1283, Palatine, IL 60078, 312-397-2898; $19.95.*

(F) Home Bingo, a program that lets you play bingo at home. The numbers are as large as your monitor display, and randomly selected numbers are never repeated during any game. Requires 32K; for the CoCo 1, 2 and 3. *Williams Enterprises, 53 Old Derry Road, Box 7, Hudson, NH 03051, 603-883-2859; tape, $9.95; disk, $11.95. Plus $2 S/H.*

Math Games, a children's educational math package that consists of four BASIC programs: *Raceway*, *Pyramid*, *Go to the Top* and *Math Word Problems*. *Raceway* pits the player against the computer in a race of mathematical problem solving. *Pyramid* is a three-level speed drill. *Go to the Top* helps students with multiplication. *Math Word Problems* presents problems that require addition, subtraction, multiplication and division. For the CoCo 1, 2 and 3. Uses the high-speed poke. *E.Z. Friendly, Hutton & Orchard Streets, Rhinecliff, NY 12574, 914-876-3935; $19.95 plus $1.50 S/H.*

A Mazing World of Malcolm Mortar, a bricklayer's nightmare as you, an apprentice bricklayer, become lost in the mazes of a mansion gone mad. Your foreman has been transformed into the evil Malcolm Mortar, Master of the Mansion Maze and all its creepy creatures. Can you brick up the monsters and find your way through? For the CoCo 3. *Tandy Corporation, 1700 One Tandy Center, Fort Worth, TX 76102; $29.95: Available in Radio Shack stores nationwide.*

(F) Moon Runner, an arcade game in which the Trigan forces have overtaken the moon system surrounding your planet. Assigned to the Moon Runner, an amphibian surface patroller armed with lasers and missiles, you attempt to destroy the Trigan base. Requires a joystick, 32K and one disk drive. For the CoCo 1, 2 and 3. *Nick Bradbury, 10500 Sandpiper Lane, Knoxville, TN 37922, 615-966-0172; $15.*

Multi-Menu, a *Multi-Vue* compatible menu utility that allows you to define your own menus for use in the *Multi-Vue* environment, designed so that anyone can use it, not just programmers. For the 512K CoCo 3, OS-9 Level II, at least one disk drive and *Multi-Vue*. *Alpha Software Technologies, 2810 Buffon St., Chalmette, LA 70043, 504-279-1653; $19.95.*

Quest for the Ring, a sequel to *Labyrinth* in which your character, even though he has destroyed the evil wizard Zarth, must suffer the consequences of spells Zarth cast before he died. To undo the effects of the spells, you must find the ring he used to make them. Requires 64K Disk ECB; for the CoCo 1 or 2. *RTB Software, P.O. Box 777, W. Acton, MA 01720, 508-263-0563; $34.95 plus $3 S/H.*

TX Mail, a mailing list program that allows entry and editing of addresses. All entries are automatically in edit mode; the cursor is always nondestructive. For the CoCo 1, 2 and 3. *Kolesar B/S, 7 Ladd Ave., Westfield, PA 16950, 814-367-5384; $26.95 plus $2 S/H.*

Teddy Bears, an educational quiz program that employs teddy bears in the learning process. If a child gives a correct response, the bears dance. Teachers or parents can use the program to create various types of quizzes: short answer, fill-in-the-blank, true/false, etc. Joystick and mice supported. Requires 64K ECB and uses the high-speed poke. *E.Z. Friendly, Hutton & Orchard Streets, Rhinecliff, NY 12574, 914-876-3935; $19.95 plus $1.50 S/H.*

Vocal Freedom, a program that turns your CoCo into a digital voice recorder, letting you record your voice or any other sound directly into the computer's memory. Features include sound-activated playback, disk save and load and voice-activated recording. Requires 64K CoCo, Radio Shack Audio Amplifier with built-in speaker (Cat. No. 277-1008), and a microphone. *Dr. Preble's Programs, 6450 Outer Loop, Louisville, KY 40228, 502-969-1818; $34.95.*

The Zapper, a utility that allows you to patch files, as well as entire disks, directly. It displays your file or disk in a format similar to the DUMP command that comes with OS-9. Requires a 64K CoCo, one disk drive and OS-9 Level I or II. *Alpha Software Technologies, 2810 Buffon St., Chalmette, LA 70043, 504-279-1653; $19.95.*

Zoomdump, a PMODE 4 and PMODE 3 graphics screen dump that allows custom printout sizing to within a fraction of an inch. It works with Extended BASIC and a DMP-105 or compatible printer. *Codis Enterprises, 2301-C Central Drive, Suite 684, Bedford, TX 76021, 817-283-8571; $14.*

(F) First product received from this company

The *Seal of Certification* program is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the product does *exist* — that we have examined it and have a sample copy — but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW reviewers for evaluation.

— Lauren Willoughby

The second in a series of tutorials for the beginner to intermediate machine language programmer

Machine Language Made BASIC

Part II: High Finances

By William P. Nee

First, let's review the SORT program from last month's article. (See Listing 1.) In the random number portion, we used LDY #$400 to indicate the upper left corner, but in the sort portion we used LDX #$400 for the same location. This was necessary because the random routine at $BF1F uses Register X for its own computations. We could have used Register X if we had saved it prior to executing $BF1F and recalled it afterwards; it was easier to use Register Y instead, since it was unchanged. It is a good idea to check any ROM routines for the registers they use prior to putting them in your program. If you have a choice between using Register X or Register Y, use Register X as it takes less memory and executes faster.

In the random portion of our program we checked to see if we had reached the end of the text screen, but in the sort portion we had to check to see if we were one space before the end. This was necessary because loading Register D with the contents of X actually loads Register A with the contents of X and loads Register B with the contents of X+1. If we allowed X to go to the end of the text screen, X+1 would move into the beginnings of graphics — and really start to make a mess!

Line 260 uses a branch (BLS) to see if one number is less than or the same as another number. Some branches compare signed numbers and some compare unsigned numbers. Figure 1 shows a comparison of branches for signed and unsigned numbers and what these branches check for.

So far, we've been using whole numbers generally between -32,000 and +32,000, but what about larger numbers or decimals? There is a way to input and save any number within the computer's range; however, it is only accurate to nine digits.

The routine at $A390 is the equivalent of LINE INPUT in BASIC. Whatever you input is stored in memory at $2DD in ASCII format. After executing $A390, $2DC will contain a zero, $2DD+ will be the ASCII numbers, and the end will be a zero. Register B will be the length of the input plus one, and Register X will be #$2DC. Any number you input can be preceded by +, -, &H (Hex), or O (Base 8).

The routine at $9F reads whatever is in a buffer whose location is stored in $A6/A7 and continues to read the buffer one byte at a time into Register A until a zero is reached.

Finally, the routine at $BD12 will change the ASCII numbers in Register A to floating point format in FP1. Putting all of these routines together gives us a SAVE subroutine. (See Listing 2.) Check your result by using the print subroutine from last month's article, Example 13A. (See Listing 3.)

Once a number is in FP1, it usually then has to be stored in some location. The easiest way to do this is to use the routine at $BC35 to transfer a number in FP1 to the location in Register X using either its name or location. It will take five bytes to completely store the number in floating point format, so reserve five bytes for each number you will be saving in your program.

Let's try the simple program shown in Listing 4 that will take any number, store it and then print it. Our print routine is good only for printing numbers, but BASIC has a PRINT USING command that gives you much more flexibility and lets you use the $, commas, +, -, etc. The routine at $BFA1 is the PRINT USING command for machine language; however, some setup is required.

First, determine the number of characters that will be to the right of the decimal, add one, and load this into Register A. Then determine the number of characters you will need to the left of the decimal (including the $ sign, commas, number signs, etc.) and load this into Register B. Register D is then stored in Location $D8/D9. The two numbers in $D8/D9 cannot total more than 17. If they do, you will get either

---

Bill Nee bucked the "snowbird" trend by retiring to Wisconsin from a banking career in Florida. He spends the long, cold winters writing programs for his CoCo.

a wrong answer or a Function Call error message.

Location $DA must contain a number indicating which format to use. The more common numbers are:

$DA	FORMAT
#$2	(-)number
#$4	number(-)
#$8	(+/-)number
#$C	number(+/-)
#$10	floating $
#$40	floating ,
#$50	floating $/,

Adding the numbers together will combine the results. Adding one to the number will print the result in exponential format.

If you need a PRINT @, load Register D with the @ location (+#$400) and store it in Location $88 (cursor location). Then you can load Register X with a message location minus one, and JSR $B99C will print the message. Try the program shown in Listing 5.

Note that there is a space before the actual message. This space does not appear when the message is printed at Location $420. Without the space we would have had to change the message location line to LDX #MSG-1. The message must end with a zero (FCB 0) to indicate the end of the message. Instead of FCB 0 we could have used FDB $0D00 and eliminated the JSR $B958, since either will print the carriage return (#$0D).

The comparison programs (listings 6 and 7) for this article are simple financial calculators. Each program asks for the annual interest rate, the number of months of the loan (term) and the amount borrowed (financed). The programs compute the monthly payment and print the answer in the PRINT USING "$#,###.##" format. You then have the option of inputting any new amount, term, or interest rate. If you run the machine language program from BASIC clear sufficient memory first (CLEAR 200, &H3000-1).

As a project, try to modify the program so it will compute the amount, term or monthly payments depending on what you input. Don't try to compute the rate — there is no exact formula for doing so. The basic formulas used in this program are:

rate = annual rate/1200
pv = ((1+r)**term)-1/r((1+r)**term)
monthly payment = amount/pv
(** is used as a symbol for exponential)

(Questions or comments concerning this tutorial may be directed to the author at Route 2, Box 216 C, Mason, WI 54846-9302. Please enclose an SASE when requesting a reply.) □

```
                Shifts
BCC    Branch if carry clear (=0)
BCS    Branch if carry set (=1)

              Unsigned Numbers
BHI    Branch if higher
BHS    Branch if higher or same
BLO    Branch if lower
BLS    Branch if lower or same
BEQ    Branch if equal (is 0)
BNE    Branch if not equal (is not 0)

              Signed Numbers
BGE    Branch if greater than or equal (to 0)
BGT    Branch if greater (than 0)
BLE    Branch if less than or eual (to 0)
BLT    Branch if less (than 0)
BMI    Branch if minus
BPL    Branch if plus
BEQ    Branch if equal (is 0)
BNE    Branch if not equal (is not 0)
```

Figure 1: Assembly Language Branches

Listing 1:

```
        ORG   $3000
START   JSR   $A928    clear the text screen
        LDY   #$400    top left of text screen
LOOP1   LDD   #255     load register D with 255
        JSR   $B4F4    convert to a FP1 number
        JSR   $BF1F    get RND(255)
        JSR   $B3ED    put it in register D
        STB   ,Y+      put the CHR$ in register Y, move to next space
        CMPY  #$5FF    check to see if at bottom right of text screen
        BLS   LOOP1    if not, branch back to LOOP1
SORT    LDA   #1       create a
        STA   FLAG     test "flag"
        LDX   #$400    top left of text screen
LOOP2   LDD   ,X+      load register D with $400/401, move to $401
        PSHS  B        save the contents of $401
```

```
        CMPA ,S+     compare what's in $400 to what's in $401
        BLS  CONT    branch if it's less or equal to what's in $400
        EXG  A,B     if not, exchange the contents of $400 and $401
        STD  -1,X    put them back in $400 and $401
        CLR  FLAG    set the "flag" to zero
CONT    CMPX #$5FE   one away from bottom right of text screen?
        BLS  LOOP2   if not, branch back to LOOP2
        TST  FLAG    check the "flag"
        BEQ  SORT    if it's zero, sort again
        JSR  $ADFB   if not, wait for any input
        SWI          end the program (use RTS if in Basic)
FLAG    RMB  1       reserve one byte and call it "flag"
        END  START
```

Listing 2:

```
SAVE    JSR  $A390   input any number
        STX  $A6     put #$2DC in $A6/A7 (buffer location)
        JSR  $9F     increase the buffer location, store ASCII in "A"
        JSR  $BD12   make it a floating point number until reaches 0
        RTS          end the subroutine
```

Listing 3:

```
PRINT   JSR  $BDD9   transfer FP1 to buffer at $3DA
        LEAX -1,X    decrease location for sign
        JSR  $B99C   print buffer contents
        JSR  $B958   print a carriage return
```

Listing 4:

```
        ORG  $3000
SAVE    JSR  $A390   what's the number?
        STX  $A6     buffer starts at $2DC
        JSR  $9F     increase buffer, load "A" with first number
        JSR  $BD12   convert to floating point in FP1
        LDX  #NUMBER where to store it
        JSR  $BC35   move the number in FP1 to (X)
PRINT   LDX  #NUMBER where it is
        JSR  $BC14   move the number in (X) to FP1
        JSR  $BDD9   FP1 to ASCII format at $3DA
        LEAX -1,X    decrease buffer location
        JSR  $B99C   print buffer contents
        JSR  $B958   print a carriage return
        SWI          end of program
NUMBER  RMB  5
        END  SAVE
```

Listing 5:

```
        ORG  $3000
PRINT   LDD  #$420   print @ location $420 (second line down)
        STD  $88     store in cursor location
        LDX  #MSG    message location
        JSR  $B99C   print message
        JSR  $B958   print carriage return
        SWI
MSG     FCC  * THIS IS A SAMPLE MESSAGE*
        FCB  0
        END  PRINT
```

Listing 6: FINANBAS

```
1Ø CLS
2Ø INPUT"ANNUAL RATE";R:GOSUB 18
Ø
3Ø INPUT"MONTHLY TERM";T:GOSUB 2
ØØ
4Ø INPUT"AMOUNT FINANCED";AMOUNT
5Ø PMT=AMOUNT/PV
6Ø PRINT"MONTHLY PAYMENT IS - ";
7Ø PRINT USING"$#,###.##";PMT
8Ø PRINT"ANY NEW AMOUNT (Y/N)"
9Ø A$=INKEY$:IF A$="" THEN 9Ø
1ØØ IF A$="Y" THEN 4Ø
11Ø PRINT"ANY NEW TERM (Y/N)"
12Ø A$=INKEY$:IF A$="" THEN 12Ø
13Ø IF A$="Y" THEN 3Ø
14Ø PRINT"ANY NEW RATE (Y/N)"
15Ø A$=INKEY$:IF A$="" THEN 15Ø
16Ø IF A$="Y" THEN 2Ø
17Ø END
18Ø R=R/12ØØ
19Ø RETURN
2ØØ PV=((1+R)^T-1)/(R*(1+R)^T)
21Ø RETURN
```

Listing 7: FINANBIN

```
3ØØØ                ØØ1ØØ          ORG     $3ØØØ
3ØØØ BD   A928      ØØ11Ø START    JSR     $A928   CLEAR SCREEN
3ØØ3 8E   311Ø      ØØ12Ø INTR     LDX     #MSG1   FIND THE FIRST MESSAGE
3ØØ6 BD   B99C      ØØ13Ø          JSR     $B99C   PRINT IT
3ØØ9 17   ØØD8      ØØ14Ø          LBSR    SAVE
3ØØC 8E   3ØF7      ØØ15Ø          LDX     #RATE
3ØØF BD   BC35      ØØ16Ø          JSR     $BC35   SAVE THE RATE
3Ø12 8D   66        ØØ17Ø          BSR     CONV1
3Ø14 8E   312Ø      ØØ18Ø MONTHS   LDX     #MSG2   FIND MESSAGE 2
3Ø17 BD   B99C      ØØ19Ø          JSR     $B99C   PRINT IT
3Ø1A 17   ØØC7      ØØ2ØØ          LBSR    SAVE
3Ø1D 8E   3ØFC      ØØ21Ø          LDX     #TERM
3Ø2Ø BD   BC35      ØØ22Ø          JSR     $BC35   SAVE THE TERM
3Ø23 8D   68        ØØ23Ø          BSR     CONV2
3Ø25 8E   3131      ØØ24Ø AMOUNT   LDX     #MSG3   FIND MESSAGE 3
3Ø28 BD   B99C      ØØ25Ø          JSR     $B99C   PRINT IT
3Ø2B 17   ØØB6      ØØ26Ø          LBSR    SAVE
3Ø2E 8E   31ØB      ØØ27Ø          LDX     #AMNT
3Ø31 BD   BC35      ØØ28Ø          JSR     $BC35   SAVE THE AMOUNT
3Ø34 8E   3145      ØØ29Ø          LDX     #MSG4   FIND MESSAGE 4
3Ø37 BD   B99C      ØØ3ØØ          JSR     $B99C   PRINT IT
3Ø3A 8E   31Ø6      ØØ31Ø          LDX     #VARPV
3Ø3D BD   BC14      ØØ32Ø          JSR     $BC14   VARPV TO FP1
3Ø4Ø 8E   31ØB      ØØ33Ø          LDX     #AMNT
3Ø43 BD   BB8F      ØØ34Ø          JSR     $BB8F   AMOUNT*FP1
3Ø46 17   ØØ8B      ØØ35Ø          LBSR    PUSING
3Ø49 8E   315C      ØØ36Ø MORE     LDX     #MSG5   FIND MESSAGE 5
3Ø4C BD   B99C      ØØ37Ø          JSR     $B99C   PRINT IT
3Ø4F AD   9F AØØØ   ØØ38Ø LOOP5    JSR     [$AØØØ] WAIT FOR INPUT
3Ø53 27   FA        ØØ39Ø          BEQ     LOOP5
3Ø55 81   59        ØØ4ØØ          CMPA    #'Y
3Ø57 27   CC        ØØ41Ø          BEQ     AMOUNT
3Ø59 8E   3173      ØØ42Ø          LDX     #MSG6   FIND MESSAGE 6
3Ø5C BD   B99C      ØØ43Ø          JSR     $B99C   PRINT IT
3Ø5F AD   9F AØØØ   ØØ44Ø LOOP6    JSR     [$AØØØ] WAIT FOR INPUT
3Ø63 27   FA        ØØ45Ø          BEQ     LOOP6
3Ø65 81   59        ØØ46Ø          CMPA    #'Y
3Ø67 27   AB        ØØ47Ø          BEQ     MONTHS
3Ø69 8E   3188      ØØ48Ø          LDX     #MSG7   FIND MESSAGE 7
3Ø6C BD   B99C      ØØ49Ø          JSR     $B99C   PRINT IT
3Ø6F AD   9F AØØØ   ØØ5ØØ LOOP7    JSR     [$AØØØ] WAIT FOR INPUT
3Ø73 27   FA        ØØ51Ø          BEQ     LOOP7
3Ø75 81   59        ØØ52Ø          CMPA    #'Y
3Ø77 27   87        ØØ53Ø          BEQ     START
3Ø79 3F             ØØ54Ø          SWI             USE RTS IF RUN FROM BASIC
3Ø7A CC   Ø4BØ      ØØ55Ø CONV1    LDD     #12ØØ
3Ø7D BD   B4F4      ØØ56Ø          JSR     $B4F4   REGISTER D TO FP1
3Ø8Ø 8E   3ØF7      ØØ57Ø          LDX     #RATE
3Ø83 BD   BB8F      ØØ58Ø          JSR     $BB8F   RATE*FP1
```

```
3Ø86 8E   3ØF7    ØØ59Ø          LDX    #RATE
3Ø89 BD   BC35    ØØ6ØØ          JSR    $BC35   FP1 TO RATE
3Ø8C 39           ØØ61Ø          RTS
3Ø8D 8E   3ØF7    ØØ62Ø CONV2    LDX    #RATE
3Ø9Ø BD   BC14    ØØ63Ø          JSR    $BC14   RATE TO FP1
3Ø93 C6   Ø1      ØØ64Ø          LDB    #1
3Ø95 BD   BD99    ØØ65Ø          JSR    $BD99   REGISTER B+FP1
3Ø98 BD   8446    ØØ66Ø LOG      JSR    $8446   COMPUTE THE LOG
3Ø9B 8E   3ØFC    ØØ67Ø          LDX    #TERM
3Ø9E BD   BACA    ØØ68Ø          JSR    $BACA   TERM*FP1
3ØA1 BD   84F2    ØØ69Ø EXP      JSR    $84F2   COMPUTE THE EXPONENT
3ØA4 8E   31Ø1    ØØ7ØØ          LDX    #VARA
3ØA7 BD   BC35    ØØ71Ø          JSR    $BC35   FP1 TO VARA
3ØAA C6   FF      ØØ72Ø          LDB    #-1
3ØAC BD   BD99    ØØ73Ø          JSR    $BD99   FP1-1
3ØAF BD   BC5F    ØØ74Ø          JSR    $BC5F   FP1 TO FP2
3ØB2 8E   3ØF7    ØØ75Ø          LDX    #RATE
3ØB5 BD   BB88    ØØ76Ø          JSR    $BB88   FP2/RATE
3ØB8 BD   BC5F    ØØ77Ø          JSR    $BC5F   FP1 TO FP2
3ØBB 8E   31Ø1    ØØ78Ø          LDX    #VARA
3ØBE BD   BB88    ØØ79Ø          JSR    $BB88   FP2/VARA
3ØC1 8E   31Ø6    ØØ8ØØ          LDX    #VARPV
3ØC4 BD   BC35    ØØ81Ø          JSR    $BC35   FP1 TO VARPV
3ØC7 39           ØØ82Ø          RTS
3ØC8 BD   BDD9    ØØ83Ø PRINT    JSR    $BDD9   CHR$ TO BUFFER
3ØCB 3Ø   1F      ØØ84Ø          LEAX   -1,X    BUFFER LOCATION -1
3ØCD BD   B99C    ØØ85Ø          JSR    $B99C   PRINT BUFFER
3ØDØ BD   B958    ØØ86Ø          JSR    $B958   PRINT A CARRIAGE RETURN
3ØD3 39           ØØ87Ø          RTS
3ØD4 CC   Ø3Ø6    ØØ88Ø PUSING   LDD    #$Ø3Ø6  PRINT USING $#,###.##
3ØD7 DD   D8      ØØ89Ø          STD    $D8
3ØD9 86   5Ø      ØØ9ØØ          LDA    #$5Ø
3ØDB 97   DA      ØØ91Ø          STA    $DA
3ØDD BD   8FA1    ØØ92Ø          JSR    $8FA1   PRINT THE NUMBER
3ØEØ BD   B958    ØØ93Ø          JSR    $B958   PRINT A CARRIAGE RETURN
3ØE3 39           ØØ94Ø          RTS
3ØE4 9E   A6      ØØ95Ø SAVE     LDX    $A6     GET CURRENT POINTER
3ØE6 34   1Ø      ØØ96Ø          PSHS   X       SAVE IT
3ØE8 BD   A39Ø    ØØ97Ø          JSR    $A39Ø   GET INPUT (NO "," OR "$")
3ØEB 9F   A6      ØØ98Ø          STX    $A6     OUR NEW POINTER
3ØED 9D   9F      ØØ99Ø          JSR    $9F     GET NEXT CHR$
3ØEF BD   BD12    Ø1ØØØ          JSR    $BD12   CONVERT TO FP1
3ØF2 35   1Ø      Ø1Ø1Ø          PULS   X       GET OLD POINTER
3ØF4 9F   A6      Ø1Ø2Ø          STX    $A6     BACK IN LOCATION
3ØF6 39           Ø1Ø3Ø          RTS
3ØF7              Ø1Ø4Ø RATE     RMB    5
3ØFC              Ø1Ø5Ø TERM     RMB    5
31Ø1              Ø1Ø6Ø VARA     RMB    5
31Ø6              Ø1Ø7Ø VARPV    RMB    5
31ØB              Ø1Ø8Ø AMNT     RMB    5
311Ø              Ø1Ø9Ø MSG1     FCC    * ANNUAL RATE - *
311F      ØØ      Ø11ØØ          FCB    Ø
312Ø      2Ø      Ø111Ø MSG2     FCC    * MONTHLY TERM - *
313Ø      ØØ      Ø112Ø          FCB    Ø
3131      2Ø      Ø113Ø MSG3     FCC    * AMOUNT FINANCED - *
3144      ØØ      Ø114Ø          FCB    Ø
3145      2Ø      Ø115Ø MSG4     FCC    * MONTHLY PAYMENT IS - *
315B      ØØ      Ø116Ø          FCB    Ø
315C      2Ø      Ø117Ø MSG5     FCC    * ANY NEW AMOUNT (Y/N)*
3171      ØDØØ    Ø118Ø          FDB    $ØDØØ
3173      2Ø      Ø119Ø MSG6     FCC    * ANY NEW TERM (Y/N)*
3186      ØDØØ    Ø12ØØ          FDB    $ØDØØ
3188      2Ø      Ø121Ø MSG7     FCC    * ANY NEW RATE (Y/N)*
319B      ØDØØ    Ø122Ø          FDB    $ØDØØ
          3ØØØ    Ø123Ø          END    START
```

Using control codes to enhance your printer's capability

Printer Diversions and Conversions

By Cray Augsburg
Rainbow Technical Editor

Many computer users report a great deal of confusion about just what their printers are capable of doing and how to make them do those things. And in most cases the manuals offer little or no help to even the intermediate users. "How do I make it do italics?" is a typical question. A more common query here at THE RAINBOW is, "How can I make this program work with my Brand X printer, even though it was written for the Brand Y printer?"

To make a printer perform various tasks — to alter its printing modes and features — we must send it certain *control codes*. These codes are usually simple series of numbers and other characters that the printer understands and interprets via its built-in ROM. For example, to tell the Radio Shack DMP-*130* printer to print in italics, we would send the following line from BASIC:

```
PRINT#-2,CHR$(27)CHR$(66)
CHR$(1)
```

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Table 1: The ASCII Table

0	NUL	32	Space	64	@	96	'
1	SOH	33	!	65	A	97	a
2	STX	34	"	66	B	98	b
3	EXT	35	#	67	C	99	c
4	EOT	36	$	68	D	100	d
5	ENQ	37	%	69	E	101	e
6	ACK	38	&	70	F	102	f
7	BEL	39	'	71	G	103	g
8	BS	40	(	72	H	104	h
9	HT	41	)	73	I	105	i
10	LF	42	*	74	J	106	j
11	VT	43	+	75	K	107	k
12	FF	44	,	76	L	108	l
13	CR	45	-	77	M	109	m
14	SO	46	.	78	N	110	n
15	SI	47	/	79	O	111	o
16	DLE	48	0	80	P	112	p
17	DC1	49	1	81	Q	113	q
18	DC2	50	2	82	R	114	r
19	DC3	51	3	83	S	115	s
20	DC4	52	4	84	T	116	t
21	NAK	53	5	85	U	117	u
22	SYN	54	6	86	V	118	v
23	ETB	55	7	87	W	119	w
24	CAN	56	8	88	X	120	x
25	EM	57	9	89	Y	121	y
26	SUB	58	:	90	Z	122	z
27	ESC	59	;	91	[	123	{
28	FS	60	<	92	\	124	|
29	GS	61	=	93	]	125	}
30	RS	62	>	94	^	126	~
31	US	63	?	95	_	127	rubout

Table 2: Hexadecimal/Decimal Conversions

00	0	20	32	40	64	60	96	80	128	A0	160	C0	192	E0	224
01	1	21	33	41	65	61	97	81	129	A1	161	C1	193	E1	225
02	2	22	34	42	66	62	98	82	130	A2	162	C2	194	E2	226
03	3	23	35	43	67	63	99	83	131	A3	163	C3	195	E3	227
04	4	24	36	44	68	64	100	84	132	A4	164	C4	196	E4	228
05	5	25	37	45	69	65	101	85	133	A5	165	C5	197	E5	229
06	6	26	38	46	70	66	102	86	134	A6	166	C6	198	E6	230
07	7	27	39	47	71	67	103	87	135	A7	167	C7	199	E7	231
08	8	28	40	48	72	68	104	88	136	A8	168	C8	200	E8	232
09	9	29	41	49	73	69	105	89	137	A9	169	C9	201	E9	233
0A	10	2A	42	4A	74	6A	106	8A	138	AA	170	CA	202	EA	234
0B	11	2B	43	4B	75	6B	107	8B	139	AB	171	CB	203	EB	235
0C	12	2C	44	4C	76	6C	108	8C	140	AC	172	CC	204	EC	236
0D	13	2D	45	4D	77	6D	109	8D	141	AD	173	CD	205	ED	237
0E	14	2E	46	4E	78	6E	110	8E	142	AE	174	CE	206	EE	238
0F	15	2F	47	4F	79	6F	111	8F	143	AF	175	CF	207	EF	239
10	16	30	48	50	80	70	112	90	144	B0	176	D0	208	F0	240
11	17	31	49	51	81	71	113	91	145	B1	177	D1	209	F1	241
12	18	32	50	52	82	72	114	92	146	B2	178	D2	210	F2	242
13	19	33	51	53	83	73	115	93	147	B3	179	D3	211	F3	243
14	20	34	52	54	84	74	116	94	148	B4	180	D4	212	F4	244
15	21	35	53	55	85	75	117	95	149	B5	181	D5	213	F5	245
16	22	36	54	56	86	76	118	96	150	B6	182	D6	214	F6	246
17	23	37	55	57	87	77	119	97	151	B7	183	D7	215	F7	247
18	24	38	56	58	88	78	120	98	152	B8	184	D8	216	F8	248
19	25	39	57	59	89	79	121	99	153	B9	185	D9	217	F9	249
1A	26	3A	58	5A	90	7A	122	9A	154	BA	186	DA	218	FA	250
1B	27	3B	59	5B	91	7B	123	9B	155	BB	187	DB	219	FB	251
1C	28	3C	60	5C	92	7C	124	9C	156	BC	188	DC	220	FC	252
1D	29	3D	61	5D	93	7D	125	9D	157	BD	189	DD	221	FD	253
1E	30	3E	62	5E	94	7E	126	9E	158	BE	190	DE	222	FE	254
1F	31	3F	63	5F	95	7F	127	9F	159	BF	191	DF	223	FF	255

The first code sent to the printer in this case is CHR$(27). This stands for escape (ESC) and tells the printer a control code is to follow. (Note: Some control codes do *not* require the escape code to be sent first.) The CHR$(66) code addresses the printer's italics function, and the CHR$(1) tells the printer to turn this feature on. If we substitute a zero for the one in this last code, we tell the printer to turn its italics mode off.

"Control codes are usually a simple series of numbers and other characters that the printer understands and interprets via its built-in ROM."

One confusing aspect of printer codes is that they can be sent to the printer in many different forms. For example, we could have sent ASCII character designations in the above example. The following line does this:

```
PRINT#-2,CHR$(27);"B;"CHR$
(1)
```

Some printers go a step further and allow the user to enter

```
PRINT#-2,CHR$(27);"B1"
```

to accomplish the same task. The ASCII table shown in Table 1 shows that the number 66 can be represented by the uppercase letter B. On the other hand, the ASCII character 1 translates to a numeric value of 49. A little experimentation is usually necessary before you begin to understand these differences and how your printer interprets them.

The control codes used to access the various features of your printer are found in the manual accompanying the printer. They are usually presented in tabular form near the back. In addition, I have provided in tables 3 and 4 summarized lists of some of the more commonly used codes. Their presentation allows you to cross-reference codes for

Table 3: Epson codes

Y - code is supported
N - code not supported
D - different code used

Function	Codes	Star NX-10	Star NX-1000	Epson MX-80	Epson FX-80	Epson RX-80	Okidata 190+, 290+[1]	Panasonic 1080i and 1091i	Citizen 120D	Seikosha SP-1000A
Underline On	27 45 1	Y	Y	Y	Y	Y	Y	Y	Y	Y
Underline Off	27 45 0	Y	Y	Y	Y	Y	Y	Y	Y	Y
Italics On	27 52	Y	Y	Y	Y	Y	D[3]	Y	Y	Y
Italics Off	27 53	Y	Y	Y	Y	Y	D[3]	Y	Y	Y
Draft/Normal	27 120 0	Y	Y	N	N	N	D[4]	Y	Y	Y
Correspondence/NLQ	27 120 1	Y	Y	N	N	N	D[5]	Y	Y	Y
Pica Pitch	27 80	Y	Y	N	Y	Y	D[6]	Y	Y	Y
Elite Pitch	27 77	Y	Y	N	Y	Y	D[7]	Y	Y	Y
Condensed	15 (on) 18 (off)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Elongated On	27 87 1	Y	Y	Y	Y	Y	Y	Y	Y	Y
Elongated Off	27 87 0	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bold On [2]	27 69 (27 71)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bold Off [2]	27 70 (27 72)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Unidirectional On	27 85 1	Y	Y	Y	Y	Y	Y	Y	Y	Y
Unidirectional Off	27 85 0	Y	Y	Y	Y	Y	Y	Y	Y	Y
Right Margin Set	27 81 n	Y	Y	Y	Y	Y	D[8]	Y	Y	Y
Left Margin Set	27 108 n	Y	Y	N	Y	Y	D[8]	Y	Y	Y
Page Length (Lines)	27 67 n	Y	Y	Y	Y	Y	Y	Y	Y	Y
Paper-Out On	27 57	Y	Y	Y	Y	Y	Y	Y	Y	Y
Paper-Out Off	27 56	Y	Y	Y	Y	Y	Y	Y	Y	Y
6 Lines Per Inch	27 50	Y	Y	Y	Y	Y	Y	Y	Y	Y
8 Lines Per Inch	27 48	Y	Y	Y	Y	Y	Y	Y	Y	Y
Superscript On	27 83 0	Y	Y	Y	Y	Y	Y	Y	Y	Y
Subscript On	27 83 1	Y	Y	Y	Y	Y	Y	Y	Y	Y
Super/Subscript Off	27 84	Y	Y	Y	Y	Y	Y	Y	Y	Y

1) Okidata 190+ and 290+ series using IBM Personality Modules.
2) Some printer manuals indicate the user should use emphasized while others suggest enhanced.
3) Italics on = 27 37 71, Italics off = 27 37 72
4) Draft speed = 27 35 49
5) NLQ mode = 27 73 51
6) Pica pitch = 18
7) Elite pitch = 27 58
8) Left and right margins are set simultaneously: 27 88 l r

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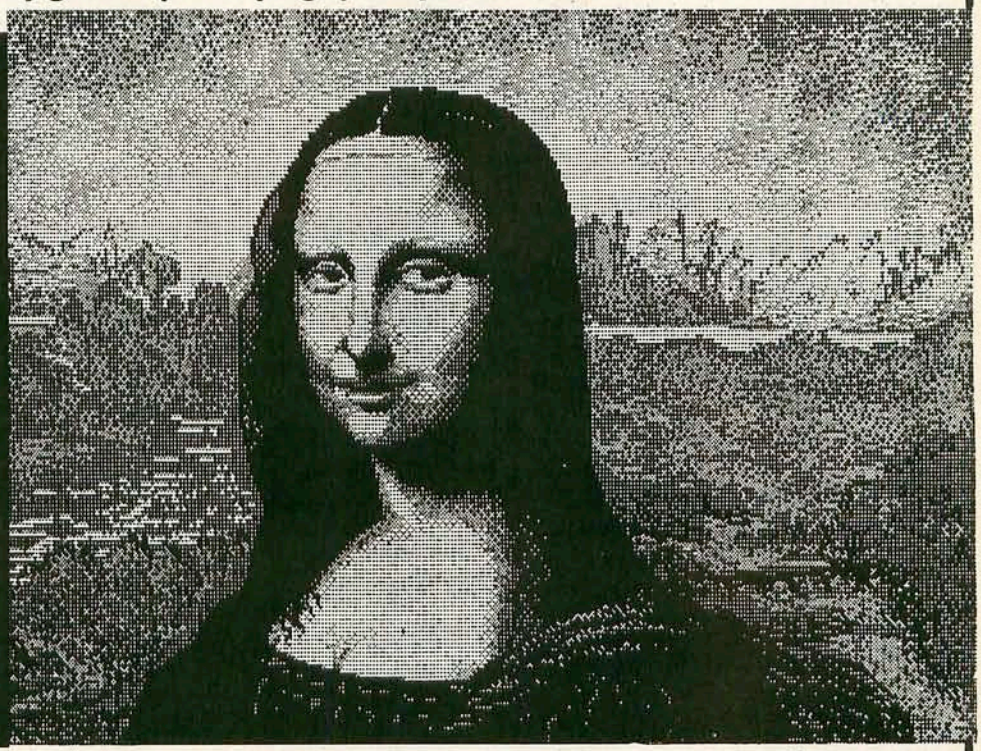

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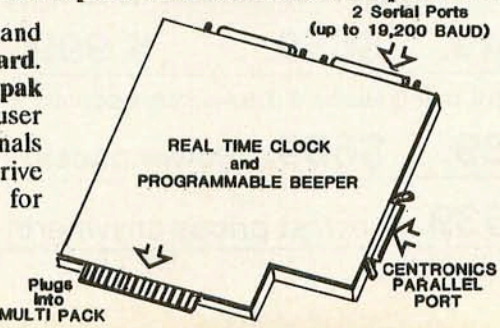

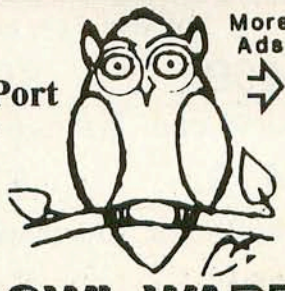

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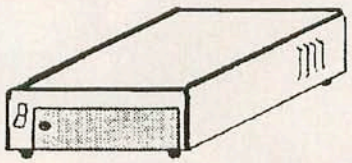

10 Meg.	20 Meg.	40 Meg.	80 Meg. (2 X 40 Meg.)
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Add to Existing OS-9 Drive Without Reformat	YES	Yes(?)	No
Drives 0-3 Hard/Floppy	YES	No	Yes
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Speed*	FAST	Fast	Fast

*All feature details are believed to be true at time of writing and are subject to change. We believe that our BASIC hard drives are the fastest due to our indexing method, but all three systems are fast. On ours all BASIC commands work including DSKINI, DSKI$, and DSKO$.

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your printer to others. Armed with this information, a little common sense and a moderate amount of time, you can modify BASIC programs from THE RAINBOW that were written for other printers, as well.

Not counting LaserJets and certain other printers, we come into contact with three basic types of control codes used by printer manufacturers: Epson Standard codes, IBM codes and Tandy codes. For the most part, the Epson and IBM codes are identical. To see some of the differences, however, compare the Okidata (IBM mode) codes presented in Table 3 with those for the other printers. The largest schism we see is between the Tandy-type codes and the other two. More work is usually required in converting between these types.

"One confusing aspect of printer codes is that they can be sent to the printer in many different forms."

To convert a BASIC program for your printer, first go through the listing line by line and determine which lines contain control codes and what those codes are. I find the best way to do this is to look for lines that contain PRINT#-2. In some cases the program may send character strings (CHR$) that are not control codes, but simply print data. For example, instead of using PRINT#-2,"*" to print an asterisk, the programmer might have chosen to use PRINT#-2,CHR$(42). Watch for this situation, and experiment to find the differences between control codes and data to be printed.

If you know for which printer the program was written, you can compare the codes you find and quickly replace the codes with those for your own printer. Keep in mind that you may have to refer to the ASCII and Hex tables (tables 1 and 2) in correctly determining the proper codes and their corresponding functions.

If you don't know which printer the author used, your work will be a little harder. You can compare the codes you find with those given in these tables to determine what function is being used. Then cross-reference the code for your printer.

In addition to information about various dot matrix printers, I have included the codes for the Radio Shack DWP-210 and DWP-230 printers (Table 5). As expected, these daisy-wheel printers don't offer as much control to the user. Also, Table 6 shows the various codes used for the Radio Shack CGP-220 Inkjet printer.

Some control codes are standard for nearly every printer made. These codes control basic printhead and platen movement and are listed below.

CHR$(8)	backspace
CHR$(10)	forward linefeed
CHR$(12)	formfeed
CHR$(13)	carriage return

Table 4: Radio Shack DMP codes

Y - code is supported
N - code not supported
D - different code used

Function	Codes	Radio Shack DMP-130	Radio Shack DMP-105/106
Underline On	15	Y	Y
Underline Off	14	Y	Y
Italics On	27 66 1	Y	N
Italics Off	27 66 0	Y	N
Draft/Normal	27 19	Y	N
Correspondence/NLQ	27 18	Y	N
Pica (10 CPI)	27 19	Y	Y
Elite (12 CPI)[1]	27 23 (27 29)	Y	Y
Condensed (16.7 CPI)	27 20	Y	Y
Elongated On	27 14	Y	Y
Elongated Off	27 15	Y	Y
Bold On	27 31	Y	Y
Bold Off	27 32	Y	Y
Unidirectional On	27 85 1	Y	Y
Unidirectional Off	27 85 0	Y	Y
Right Margin Set	27 82 n	Y	N
Left Margin Set	27 81 n	Y	N
Page Length (inches)	27 52 n	Y	N
Paper-Out On		N	N
Paper-Out Off		N	N
6 Lines Per Inch	27 54	Y	Y
8 Lines Per Inch	27 56	Y	Y
Superscript On[2]	27 83 0	Y	Y
Subscript On[2]	27 83 1	Y	Y
Super/Subscript Off[2]	27 88	Y	Y

1) Second code shown is for NLQ Elite pitch.
2) Super- and subscripts not supported on the DMP-105

Table 5: Radio Shack DWP printers

Function	Codes	DWP-210	DWP-230
Underline On	15	Y	Y
Underline Off	14	Y	Y
Pica (10 Pitch)	27 15	Y	Y
Elite (12 Pitch)	27 14	Y	Y
Bold On	27 31	Y	Y
Bold Off	27 32	Y	Y

As a final note, you will undoubtedly encounter some codes for which your printer offers no direct equivalent. For example, your particular printer may not support super- and subscript printing. However, if it supports half-reverse and half-forward linefeeds, you will find these codes can be combined to emulate super- and subscripts. Trial and error is often helpful in altering programs. There may also be times when your printer cannot duplicate a particular function. In these cases it is up to you to determine whether you leave the code out altogether or try a different approach.

Based on the difficulties often encountered in converting codes for various printers, I ask that all programmers who submit material to THE RAINBOW follow certain guidelines. Please include a table with your submission detailing the printer control codes used by your program, the functions they perform and in which lines they appear. Finally, let the reader know exactly which printer your program is designed for. With this information and the printer manual, RAINBOW readers should be able to make quick work of deleting your codes and replacing them with those for their system.

Table 6: Codes for the CGP-220

CHR$(8)	Backspace in text mode.
CHR$(11)	Reverse Line Feed in text mode.
CHR$(17)	Select Text Mode.
CHR$(18)	Select Graphic Mode.
CHR$(29)	Change color in Text Mode.
A	Reset
C*number*	Change color. *number* from 0-3.
D*destination*	Draw from current coordinate to specified position.
H	Move pen to current origin w/o drawing.
I	Sets new origin.
J*destination*	Draw a line from current pen location *x* steps to the right and *y* steps up.
L*type*	Change line type (0-15). 0 is a solid line. 1-15 draw dashed lines.
M*x,y*	Move without drawing to location *x* steps right (left) and *y* steps up (down) of present origin. *Absolute.*
P*characters*	Print characters in Graphic Mode.
Q*direction*	Change print direction. *direction* is 0-3. 0=normal, left-to-right; 1=top-to-bottom; 2=upside-down; 3=bottom-to-top.
R*x,y*	Move without drawing from present location to location *x* steps to the right (left) and *y* steps up (down). *Relative.*
S*size*	Specifies size of printed characters drawn with P command.
X*axis,step, intervals*	Draw a coordinate axis from present location in direction specified by *axis* using increments of *step* and marking *intervals* of them.

Due to the complexities and differences involved, I have avoided discussion of graphics control codes and the transfer of graphics data. This information can be used as a stepping stone, however, if you are interested in learning more about printers.

Isolating and repairing keyboard problems

Ar_ Y_u Missi_g S_m_thi_g?

By Roger D. Dowd

I like to experiment with many hardware modifications and do all of my own repairs on my Color Computer. This normally involves removing and re-inserting the keyboard, causing a lot of wear and tear on the delicate keyboard connector.

The keyboards (CoCo 1 'F' Board and later) for Radio Shack's Color Computers are made of a very fragile plastic membrane, with thin conductor runs on one side. The conductor runs are easily damaged if scratched or overflexed. Once damaged, the runs cannot be repaired by soldering, as the heat from the soldering iron melts the plastic. Replacement keyboards can be purchased for between $5 and $50, although the $5 keyboards that were discontinued by Radio Shack a year or two ago are getting more difficult to find.

The procedures described in this article require that some tests be performed with the computer's cover removed and the power on. Hazardous and potentially lethal voltages exist inside the computer around the power supply and on-off power switch. Be extremely careful around this area of the computer. The rest of the computer contains very low voltages, but relatively high current. Remove any jewelry from your wrists and hands to avoid personal injury from shock or burns and possible damage to the computer. Every effort has been made to provide accurate information and safe procedures. Neither the author or the publisher will be held liable for any injuries to person or damage to equipment. Be aware that removal of the computer cover and subsequent modification or repairs will void any existing warranties.

Before I explain how to repair the keyboard, it is important to first explain that keyboard problems can appear from different sources. The first, as mentioned above, is due to stress and abuse of the keyboard connector. The other is from a faulty Peripheral Interface Adapter (PIA). If you have never taken your computer apart or it has been some time since you had it apart, and you suddenly develop keyboard trouble, suspect a faulty PIA.

PIA trouble can cause such symptoms as missing characters, erroneous characters appearing from seemingly nowhere, intermittent key bounce or a dead keyboard. The easiest way to check for a defective PIA is to simply replace the suspect PIA with a known good one. You will need to refer to the technical reference manual for your particular model CoCo to find which PIA to replace. Always use an exact replacement.

On the newer model CoCos (CoCo 2B, CoCo 3s), the PIA chips are soldered directly to the board. To remove the PIA chips from the later model CoCos, you will have to carefully desolder the chips with a desoldering tool and desolder wick. (Note: This is a job for someone who is skilled in soldering and desoldering integrated circuits.) Before reinstalling the PIA chip, solder in a socket first, then plug in the PIA chip. Any time you do any modification or repair where you must desolder a chip, solder in a socket first before you reinstall the chip. This will save you a lot of aggravation later, as well as wear and tear on the computer circuit board.

To determine which run or line is open, type in the following jingle exactly as it is written: `The quick brown fox jumped over the lazy dog's back 0123456789`. This jingle will test the entire keyboard matrix. Make note of all the characters that are missing. Looking at Figure 1, you will see 16 lines coming from the keyboard matrix. Find the line that all of the missing characters have in common. For example, on my keyboard the G, O, W, space bar and 7 characters were missing. All of these keys have Line 16 in common. If the letters P, Q, R, S, T, etc., had been missing, then Line 4 would have been defective.

To repair a damaged connector you will need to purchase Loctite's "Quick Grid" Rear Window Defogger Repair Kit, Part No. 15067, available for about $7 at most hardware and auto parts stores. The heart of this kit is a very tiny bottle of highly conductive paint. Be-

Roger Dowd (WA4QAS) is an electronics technician and an advanced class amateur radio operator. His hobbies include packet radio, computers, and building and experimenting with all types of electronic projects.

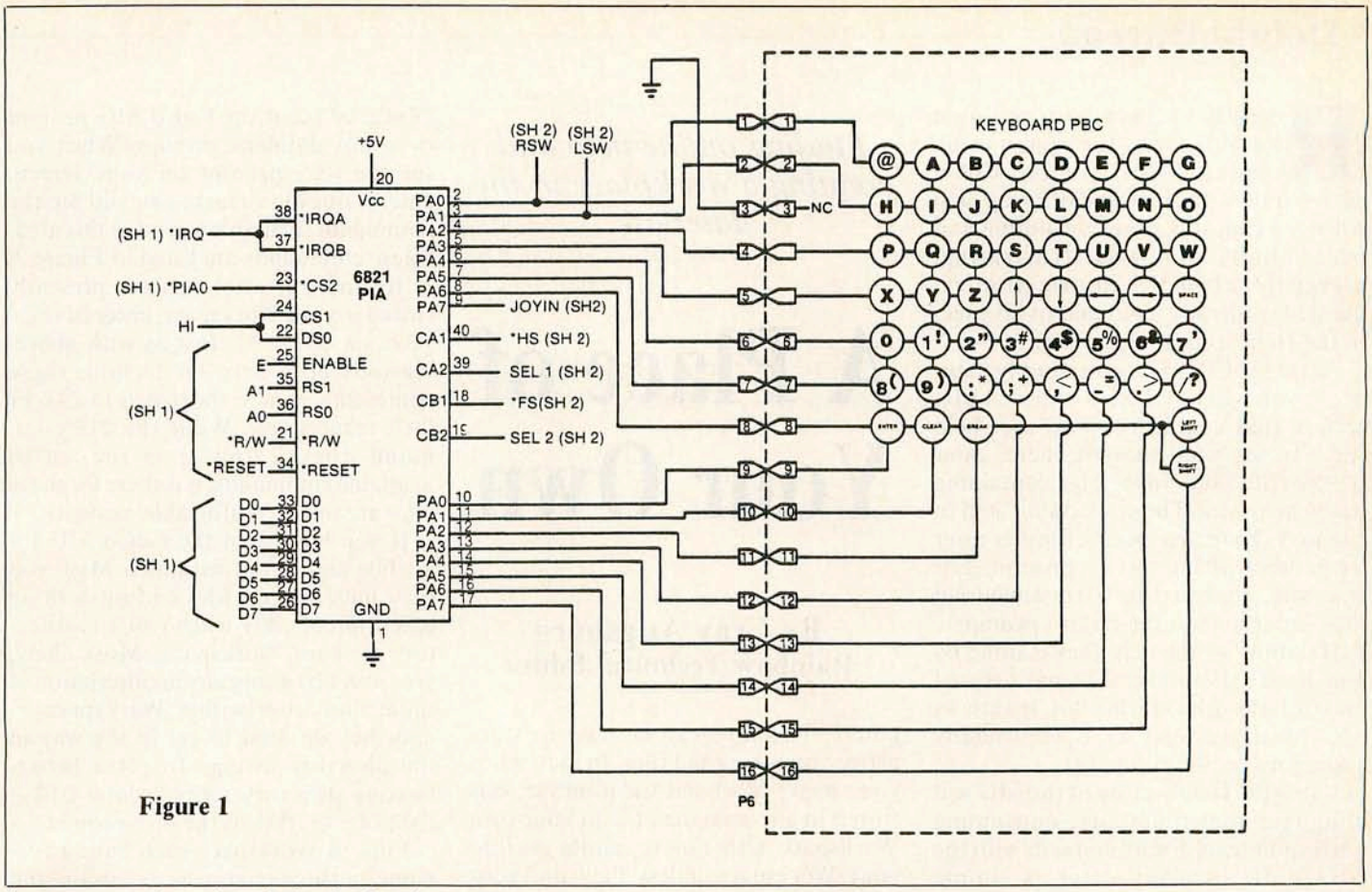

Figure 1

fore you use the paint, shake the bottle very vigorously to get the conductive material to mix with the liquid medium. The paint dries extremely fast, so keep the lid on the bottle whenever you are not actually using it. Because the tiny bottle is so expensive I recommend not using the brush normally supplied with the kit, but straightening a paper clip and using that instead. This will prevent too much of the precious paint from being wasted on the brush. Carefully dip one end of the paper clip into the paint until a small amount of paint has collected on the end of the clip. Dot the paint gently onto the break in the run, making sure to overlap both sides of the break. It will take only a minute or two to dry. Once it has dried, repeat the process two or three more times to get a good coat built up and to ensure good conductivity. Try not to get any of the paint on any of the neighboring runs. After the final coat has been applied, wait about five or 10 minutes for the paint to completely dry. Gently scrape any excess paint from each side of the run with an X-acto knife.

Measure the repaired run for conductivity. If you don't have good conductivity, you will have to scrape off the old paint and repeat the entire process. Failure to get good conductivity is most likely due to not shaking the paint well enough. You *must* shake the paint bottle *vigorously*! One of my keyboards had excessive run damage, with one run almost entirely destroyed. I repainted nearly the entire run and restored the keyboard to full use. Although the price of the repair kit may seem expensive, remember that it can have other uses around the home or shop. This is especially true if you etch and build many of your own electronic projects, as I do.

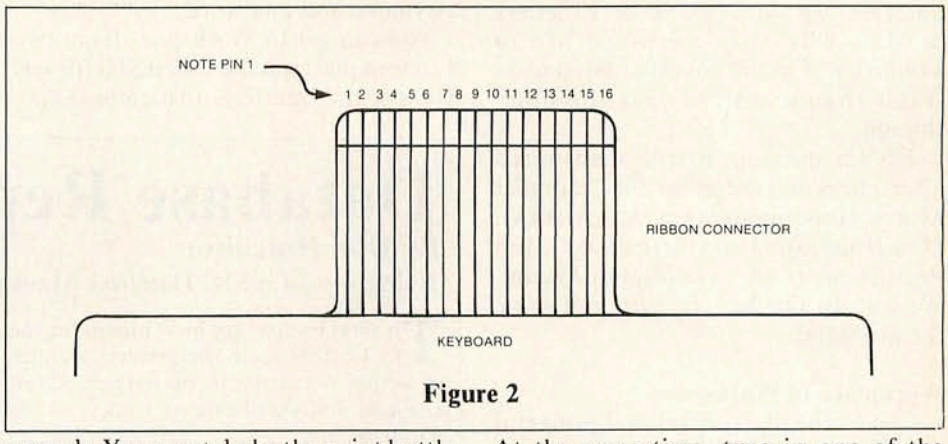

Figure 2

If a break or tear in the run is not obvious, determine if the problem is a spread pin by turning the computer on. With a small, blunt metallic probe, such as a probe of an ohmeter, gently touch the suspect socket pin and keyboard connector run at the point (in the first example, Pin 16) where the two meet. At the same time, type in one of the characters that was missing. If the key suddenly begins to work but then just as suddenly quits working when the probe is removed, your problem is most likely a spread pin inside the motherboard socket. This may be fixed by removing the keyboard and gently and carefully squeezing the socket together with a pair of pliers. If that doesn't work, the socket may have to be replaced. A replacement socket may be ordered from Tandy National Parts Center.

(Questions or comments regarding this project may be directed to the author at 205 Williams Drive, Bonaire, GA 31005. Please enclose an SASE when requesting a reply.)

Finding online help and creating a workplace in the database

A Place of Your Own

By Cray Augsburg
Rainbow Technical Editor

Recently we have been getting a lot of requests for help in using various aspects of the CoCo SIG. While we don't mind offering help when we can, it is time-consuming and occasionally somewhat frustrating, especially when the information requested is already available to all users in the Help section of the SIG.

At the CoCo SIG menu, simply enter HELP; you will be taken to a special SIG section that contains several user help files. To see what files are there, enter SCAN or SC. You will see a list containing many help files. These are duplicated in Figure 1. To read a specific file just enter its number at the Help> prompt. For example, to learn how to download files, enter a 40 at the Help> prompt.

Handling of the help files is done by Jim Reed (JIMREED). Jim has created most of the files during his tenure as SIG Manager, and he is continually adding more files to the list.

Using the Help section of the SIG will eliminate sometimes time-consuming correspondence back and forth with the SIG staff. In many cases, a simple question can turn into 10 or 12 letters in Mail. Obviously, we would like to avoid this if at all possible. We understand that it isn't always possible, though.

If your question is still unanswered after checking the Help files, contact Marty Goodman (MARTYGOODMAN), Don Hutchison (DONHUTCHISON), Jim Reed or me (CRAY) via Mail or Forum. We will do our best to help you solve the problem.

Workplace in Workspace

One of the most useful and powerful areas of Delphi is the Workspace area. At the same time, it is often the most unused area. Many users, especially newer ones, are easily intimidated by Workspace — or they just don't understand all the power it gives them. It doesn't take an interested user long to find out that in order to upload a file, it must be done from within this area.

Every Delphi user has a personal storage area set aside on Delphi's computers. This area can be used to store private messages and files. In fact, when you receive Mail and file it online, it is stored in a special mail file in your own Workspace. Other users cannot get into your Workspace unless they use your username and password.

You can get to Workspace from two different places in the CoCo SIG (or any SIG for that matter). Just enter WORKSPACE or WO at the CoCo SIG prompt or at any database prompt. When you see the WS> prompt on your screen, enter a question mark; you will see the commands available to you in this area. These commands are listed in Figure 2.

To find out what files are presently stored in your Workspace, enter DIRECTORY or CATALOG. Just as with abbreviations elsewhere on Delphi, these commands can be shortened to DIR or CAT, respectively. While the DIR command doesn't appear in the list of available commands, it is there for those who are more comfortable using it.

If you have used the CoCo SIG for a while and have filed much Mail, you may have several files ending with an extension of .MAI when you do a directory of your Workspace. Most likely, you won't be doing any manipulation of these files from within Workspace — and they do tend to get in the way in the directory listing. To get a better-looking directory output, enter DIR /EXCLUDE=*.MAI at the WS> prompt.

Files in Workspace each have a filename, a three-character extension and a version number. The filename and extension should be self-explanatory to most users. The version number, however, may cause some confusion for

Cray Augsburg is RAINBOW's technical editor and has an associate's degree in electrical engineering. He and his wife, Ruth Ann, have two children and live in Louisville, Kentucky. His username on Delphi is CRAY.

Database Report

By Don Hutchison
Rainbow CoCo SIG Database Manager

This has been a very busy month for the CoCo SIG, with the greatest amount of action occurring in the Graphics and Utilities and Applications topics of the database.

OS-9 Online

In the General topic of the database, **Kevin Darling** (KDARLING)posted a text file describing a method for running *Sub Battle* under *Multi-Vue*. The method is also applicable to other programs that require a VDG screen to operate.

In the Applications topic of the database, **Dennis Weldy** (OS9ER) uploaded SCREEN PAINTER, a utility for setting up the screen form to your liking with *Sculptor*. **Steve Clark** (STEVECLARK) posted a revised text search and find utility that reads filenames from the standard input rather than from a fixed filename. Steve also uploaded a menu choice application program for Level II that allows the creation of mouse- or joystick-controlled applications.

In the Utilities topic of the database, **Brian Wright** (POLTERGEIST) posted a utility using English-language variables and decimal numbers that is a replacement for the DISPLAY command. Kevin Darling, with the kind permission of Ron Lammardo, posted *Shell+*(Version 1.2) for OS-9 Level II. *Shell+* is designed as a replacement for the current shell on Level II CoCo 3s. It features some fixes for the previous version, a programmable prompt, shell scripts in the current execution directory and a few other neat things. **Bruce Terry** (THEMAGE) uploaded both an Icon and a font editor to run under WindInt.

In the Device Drivers topic of the database, **Greg Law** (GREGL) gave us five VDG device descriptors, called V0 through V4, which can be used along with Term_Win and windows. **Ken Schunk** (KENSCHUNK) posted a driver that cures a problem in the VDG driver supplied with the developer's pack. The driver was

written by Volney Larowe of Saratoga Springs, NY. Brian Wright sent us a device driver that partitions a CoCo 3's 512K memory into a fast RAM disk.

In the Patches topic of the database, **Michael Washburn** (COMPZAP) posted PGPATCH, a text file describing how to patch PHANTOMGRAPH to work with Star Gemini printers (10x, 15x and possibly others), using a MODPATCH script (included) or by using a IPATCH.

In the Graphics and Music topic of the database, **Mark O'Pella** (MDODELPHI) uploaded an original composition done using *Umuse*.

CoCo SIG

In the General Information topic of the database, I (DONHUTCHISON) uploaded a humorous document concerning some of the not-too-obvious benefits of going to RAINBOWfest, while **Marty Goodman** (MARTYGOODMAN) posted two informative reports about the Chicago RAINBOWfest as it was happening. **Roger Bouchard** (HARBIE) posted a text file describing the various alternatives for phone users in accessing the information services. Roger also uploaded several comic files for the amusement of SIG members, as well as some interesting commentaries concerning a pirate BBS and the effect of plastics on the environment. I also posted some humorous files passed to me by Rick Adams from UseNet concerning hotel soap and more of the light bulb trivia.

In the CoCo 3 Graphics topic of the database, **Orman Beckles** (ORMAN) uploaded his utility called Super XL256 Mach I, which is a new version of Roger Bouchard's XL256. Orman's version allows the user to load a digitized picture, alter the horizontal and vertical position, change the colors and then save the resulting picture in *CoCoMax 3* format. **Heath Dingwell** (OS9KID) uploaded several nudes in *CM3* format, his favorite *CM3* picture viewer, some *CM3* pictures from popular James Bond films and some detailed pictures of sports cars. **Donald Ricketts** (STEVEPDX) uploaded a palette changer utility for digitized *CM3* images. Roger Bouchard posted an upgrade for his popular XL256 utility for converting digitized images to *CM3* format, as well as a revised version of his demo program for MGE

serious users unless they learn to understand them. We will hold off discussion of version numbers until we have some files to work with.

Creating a File

To write or build a text file in your Workspace, you will use the CREATE command. Enter CREATE *filename* at the WS> prompt. For this example, use TEST1.TXT as the filename. When Delphi is ready for you to write the text file, it will tell you to enter your text. It also explains your options of using CTRL-Z to save the file or CTRL-C to abort the creation process. Now type the following lines, pressing ENTER after each:

```
THIS IS MY FIRST LINE.
THIS IS MY SECOND LINE.
THIS IS THE FINAL LINE.
```

When you have pressed ENTER after the last line, press CTRL-Z and your file will be saved. Now when you enter DIR, you should see TEST1.TXT;1 as one of the entries. Let's go ahead and create a second file. Call this one TEST2.TXT. Enter each of the following lines in this new file:

```
SECOND FILE, FIRST LINE.
SECOND FILE, SECOND LINE.
SECOND FILE, FINAL LINE.
```

Figure 1: List of help files available in Help section of CoCo SIG.

```
 1 APPOINTMENT CALENDAR
 2 AUTO-HANGUP ON TELENET
 3 CHANGING YOUR PASSWORD
 4 COCO COMPOSER HELP
 5 CONFERENCE HELP
 6 CONFERENCE HINT
 7 CONFERENCE: /DIR & /DISPLAY
 8 CONTROL CODES
 9 CONTROL-O RESPONSIVENESS
10 CONTROL-Z IS HANDY.
11 DATABASE HINT, LEADING SPACES
12 DATABASE STANDARDS
13 DATABASE UPDATE 9-15-87
14 DECEMBER DELPHI NEWSLETTER
15 DEFAULTING INTO THE COCO SIG
16 DELPHI COMMAND CARD
17 DELPHI: THE OFFICIAL GUIDE
18 DISABLING CALL WAITING
19 DOT COMMANDS IN FORUM
20 ECHO CAUSES DOUBLE LETTERS
21 EDIT MODE
22 EDITING IN FORUM HINT
23 EDITOR: PICK FROM TWO
24 EDITOR:OLDIE COMMANDS
25 ELIM. MAIL IN WORKSPACE DIR
26 ENT: TO SEE LAST ENTRY
27 FOLDERS ENHANCE MAIL FACILITY
28 FORUM CHANGES, 11/8/86
29 FORUM CHANGES, 12/29/86
30 FORUM COMMAND LIST
31 FORUM EDITING HINT
32 FORUM ENHANCEMENT, 1/5/86
33 FORUM HELP
34 FORUM READING NONSTOP
35 FREE UPLOAD TIME AVAILABLE
36 GETTING INTO MAIL QUICKLY
37 GO COMMAND
38 HANDLES ARE HANDY
39 HELP IS ALWAYS AVAILABLE
40 HOW TO DOWNLOAD FILES
41 LINEFEEDS
42 MENUS CAN BE ELIMINATED
43 MORE? PROMPT CAN BE ALTERED
44 NEW DELPHI BOOK OUT
45 NEW SIGWARE, 12/15/86
46 NEW SIGWARE, 8/1/87
47 NO SUCH USER
48 PAGERS ARE TOO IMPATIENT
49 PROFILE NEEDED FROM YOU!
50 QUICK (TRUE) BREAK
51 QUIT COMMAND IN FORUM
52 RAINBOW DATABASE & CASSETTE US
53 RAINBOW ON TAPE DATABASE
54 RAINBOW ON TAPE DOWNLOADING
55 RAINBOW ON TAPE ORDERS
56 RAINBOW SUBSCRIPTION PROBLEM
57 READING NONSTOP OVER RANGE
58 ROLL THEM BONES
59 SETTING SETTINGS
60 SUBMISSIONS FOR RAINBOW PUBLIC
61 SUBMITTING A FILE
62 SURCHARGED DOWNLOADS
63 SURCHARGED FILES EXPLAINED
64 TELENET LOGON PROCEDURE
65 THE /NAME COMMAND IN CONFERENC
66 TIMEOUT CAN BE VARIED
67 TIP FOR PRINTOUTS
68 TO SKIP A SECTION
69 TO STOP OUTPUT
70 TRY /TIME
71 UNWARRANTED "NO SUCH USER" MES
72 USERNAME CAN BE CHANGED
73 USING THE MEMBER DIRECTORY
74 VOTE IN OUR POLLS
75 WHEN YOU ARE PAGED
76 XMODEM DOWNLOADING
77 XMODEM UPLOADING
78 YOUR OWN NAME NEEDED
```

pictures. The CoCo Gallery pictures for the months of February through July 1988 are now available, also. (NOTE: The Gallery pictures are now available online at approximately the same time as the RAINBOW ON TAPE and DISK programs from each monthly issue of THE RAINBOW. They are posted in the appropriate topic of the database, either CoCo 3 Graphics or Classic Graphics.) **Mike Stute** (GRIDBUG) sent us a clever BASIC picture of a cat as he tears up his owner's curtains! **Billy Hambric** (SNOOPYDOG) sent us some digitized scenes from the motion picture *Beauty and the Beast* and a digitized shot from *Star Trek*. **Mike Andrews** (MANDREWS) sent us a text file containing the file specifications for the *MacPaint* pictures. **David Brown** (NASAI) sent us a utility called PICUP for moving a picture upward on the Hi-Res screen.

In the Utilities and Applications topic of the database, **Dave Stampe**, author of *CoCo Max 3* and other fine programs, has placed *Colour Key* in the database of the CoCo SIG! Dave gave us the programs while attending the Chicago RAINBOWfest. *Colour Key* is a powerful BASIC programmer's utility for the Color Computer 1 and 2 that incorporates many useful programming tools such as full screen editing, repeating keys, user-definable keys, automatic line number generation, full error and break key trapping, reverse video option, compatibility with the CoCo 3 in CoCo 2 mode and dozens of other handy features that no CoCo programmer should be without. A version of *Colour Key* is available for the CoCos 1 and 2 and the CoCo 3. Dave also provided us with *FFT*, a program designed to perform FFTs and IFFTs on a set of 256 data points. An FFT turns a waveform into a frequency/power graph, and an IFFT does the opposite. You could use the FFT to sample sounds, get the response of a filter from its impulse response or synthesize the response of a filter or a waveform from a set of frequencies and phases with the IFFT. **Richard Ortman** (RAO) sent us a filing system for comic book collections that also features a sort routine. **Ken Halter** (KENHALTER) uploaded a set of programs that may be used to sort multiple arrays. **David Mills** (DAVIDMILLS) uploaded an encryption utility for scrambling any or all of the files on a disk using a user-supplied code, as well as a 512K disk backup utility. **John Barrett** (JBARRETT) sent us his *Deed Checker* program for realtors, and **Alan DeKok** (ALANDEKOK) posted his *Fastdrive* utility that enables the CoCo 3 to work at double speed during all disk access. Alan included the *EDTASM+* source code as well as versions for both 1.0 and 1.1 disk ROMs.

In the Hardware Hacking topic of the database, I posted a lengthy treatise on the subject of lightning protection as discussed on another SIG. SIGop Marty Goodman was also involved in this roundtable discussion. Kevin Darling uploaded a text file that describes a fix for the problems involved with the Tandy FD 502 second drive kit.

In the Games topic of the database, **Zack Sessions** (ZACKS) uploaded an *Othello* game for the CoCo 3, a *Blackjack* game, and a *Hammurabi* game. Zack also posted Mike Ward's routines for putting the ROM pack game *Springster* on disk. John Barrett posted a *Star Frontiers* character sheet utility.

In the Classic Graphics topic of the database, **Mark Garbarini** (FI9) sent us his original drawings called *Pentagram* and *Tiger*. **Andy Duplay** (KB8BMN) uploaded a Hi-Res picture of a Bengal tiger, a conversion utility for MacIntosh pictures to *CoCo Max* format and several digitized female nudes.

In the Music and Sound topic of the database, Mike Stute sent us *The CoCo Cat Shuffle*, *Rainbow in the Dark*, and a short article about getting a better electric guitar sound from your synthesizer. **Tony Zamora** (TONYZAMORA) uploaded his *Musica 2* file converter, which produces stand-alone files from *Musica*'s MUS files. **George Hoffman** (HOFFBERGER) sent us three Pink Floyd songs for *Lyra*.

In the Product Reviews and Announcements topic of the database, **Eddie Kuns** (EDDIEKUNS) uploaded his review of *DataPack* versus *V-Term* from Gimmesoft. **Jim Goettig** (JGMG) posted an announcement about the CoBBS system for the CoCo 3.

That's it for this month. As you can see, there's plenty of good material available on the Rainbow CoCo SIG. Hope to see you all online! □

Make sure to press CTRL-Z after the last line to save the file. Great! Now we have two files in Workspace. And we can get down to learning a little more about how to manipulate files in Workspace.

Moving Files Around

First, let's try copying files with the COPY command. Enter `COPY TEST1.TXT TESTCOPY.TXT`. When you do a directory, you will see the new file TESTCOPY.TXT as an entry. The COPY command makes an exact duplicate of the first filename listed in the command line and calls this new file by the second filename listed. Note that the command and each of the filenames are separated with spaces. Play around with this if you want before we move on to the APPEND command.

Putting 'em Together

There is a very quick way to combine two files in Workspace. Simply enter APPEND *filename1 filename2*. This command adds the text from *filename1* to the end of the text in *filename2*. When this is done, filename1 is unharmed — it has been neither deleted nor changed. The contents of *filename2*, however, have been changed. Not to worry, though. The original *filename2* is still intact. What happens is that Delphi makes a copy of *filename2* and adds the text from *filename1* to it. This new file has the same name as *filename2*, but a new version number. Let's give it a try.

Figure 2: Workspace Commands

APPEND to File	PUBLISH File
CATALOG Files	PURGE Old Versions
COPY File	RENAME File
COUNT Words	SETTINGS
CREATE File	SUBMIT File
DELETE File	UNPROTECT File
DOWNLOAD File	UPLOAD File
EDIT File	KERMIT-Server
EXIT	Other Commands
HELP	New Features
LIST File	

Enter `APPEND TEST2.TXT TESTCOPY.TXT`. After Delphi finishes its work, do a directory. You should see that the following files are now in your Workspace:

```
TEST1.TXT;1
TEST2.TXT;1
TESTCOPY.TXT;1
TESTCOPY.TXT;2
```

To find out what is in these files, we can use the list command. Simply enter LIST, followed by the name of the file you want listed. You don't have to include the version number if the file you want listed is the latest version. If, however, you want to see the contents of TESTCOPY.TXT;1, the original file, you will have to enter the version number. Commands in Workspace always default to the most recent version, i.e., the one with the highest version number.

That's about all we can cover this month. Next month I hope to give some coverage to some of the uses of files in Workspace. Can you imagine sending one letter to hundreds of people on Delphi at the same time without having to retype it every time? It's actually very easy to do, and we'll be discussing that next time. See you then!

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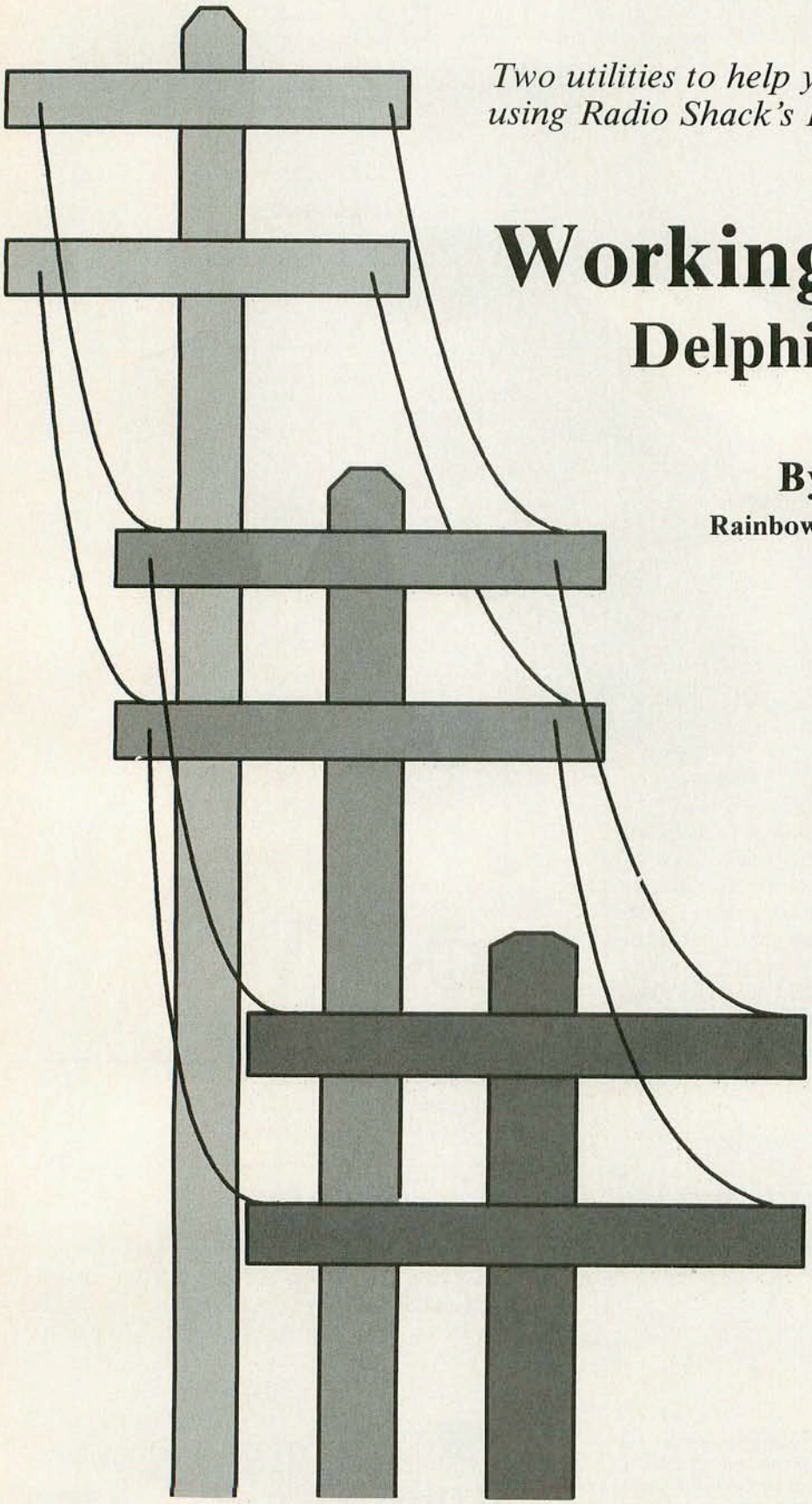


Two utilities to help you download programs using Radio Shack's Direct Connect Modem Pak

Working Together:
Delphi and Tape I/O

By Don Hutchison
Rainbow CoCo SIG Database Manager

You've got a Radio Shack Direct Connect Modem Pak, and you want to know how to use it to download programs from the CoCo SIG on Delphi? Great! Let's see what's involved.

It's a good idea to be familiar with some of the terminology that we'll be using. Refer to the article "Getting Started with Delphi" in the November '87 issue of THE RAINBOW for a beginner's tour of Delphi. For continuing information about Delphi, Cray Augsburg's monthly column "Delphi Bureau" is virtually required reading.

To sign up with Delphi, locate the directions in the Delphi ad in RAINBOW for finding your local Telenet or Tymnet access number, then call Delphi through one of these services, using your CoCo and your Modem Pak. (Refer to your Modem Pak's manual for instructions on how to connect with these services.) Follow the easy prompts and messages to sign up.

Don Hutchison is an electrical engineer and lives in Atlanta, Georgia. He works as a senior project engineer involved in the design of industrial control systems. On Delphi, Don is the Database Manager of the RAINBOW CoCo SIG. His Delphi username is DONHUTCHISON.

After your Delphi account is approved (this can take less than 24 hours if you have an approved credit card), you're ready to enjoy the goodies in the CoCo SIG's databases. Sign on to Delphi, and then type GROUPS COCO to get to the Rainbow CoCo SIG. Your Delphi Guide will give you instructions about how to get to the databases in the CoCo SIG.

The terminal program in the Modem Pak is capable of transferring any standard CoCo file between your CoCo and other CoCos or mainframe computers using the Xmodem protocol. For our purposes, we'll assume you are using a cassette system, although the Modem Pak can also be used with a disk-based system if you use a Multi-Pak. Version 2.0 and higher of OS-9 also have special drivers furnished for use with the Modem Pak.

Since Xmodem is an 8-bit protocol, the Modem Pak's communications parameters must be set up for 8 bits, no parity, and one stop bit before a file transfer is initiated. It is recommended that you use these parameters to call Delphi, since the Modem Pak doesn't automatically adjust to these parameters when it starts an Xmodem transfer. While it is possible to access Delphi at 7 bits and even parity, you'll have to change your communications parameters manually before starting a download.

After you have looked through the database (using the DIR and READ commands) for programs or files that you may be interested in downloading, it's time to do an actual Xmodem download. Don't let it frighten you, because most of the process is automatic — the hard part is waiting to get the program so you can use it!

Enter the READ command to start things moving. Suppose you want to download a game called *Yahtzee*. At the main prompt, CoCo SIG>, enter DATA GAMES. This will place you in the Games topic of the database. Now type READ YAHTZEE. You'll be given a description of the program, and then the screen will display the ACTION> prompt and wait for you to tell it what to do. Since you have decided to download the program, just enter XM for Xmodem Download. When Delphi has the information ready for you, it will send a message saying, "OK, receive!" At this point, press the @ and 1 keys together; and the file transfer (download) will start. Delphi will notify you when the transfer is completed, at which point you should save your new download to tape. Didn't hurt at all, did it? Wasn't it *easy*?

The databases on the CoCo SIG contain many different types of programs: machine language programs, tokenized BASIC programs, graphics files and more. However, the Modem Pak's terminal program was designed for downloading ASCII BASIC programs only, and it doesn't provide for creating any other file type. This makes it impossible for a Modem Pak user to download and successfully use machine language programs without some help from elsewhere. Additionally, many users desire features that simply weren't included in the software for the Modem Pak. What to do?

"When we say a program is 'tokenized' or 'compressed' BASIC, we mean that it's in the same form that would be created if you typed in a BASIC program from the keyboard and then entered CSAVE ***"filename"."***

No problem! Mike Ward has provided optional support for the Modem Pak when it's used with his popular terminal program, *MikeyTerm*. All that's needed is to run the companion program called *MTPAK*, which will adjust *MikeyTerm* to communicate with the Modem Pak. This step only needs to be done once.

What really happens is that *MikeyTerm* uses the modem portion of the Modem Pak only, bypassing the terminal software. This approach adds many useful and desirable features to a user's system; a CoCo 3 user will be especially pleased, because he will be able to access the 80-column mode of the CoCo 3 with *MikeyTerm*!

MikeyTerm features full buffer control for reviewing what you have read online. A search feature is also provided for quickly locating a selected string in the buffer. A block of the buffer may be marked and then saved to tape or printed. The most common default settings are configurable and are saved for fast startup. (No more setting up everything when you first execute the program.) *MikeyTerm* can a configured to support a I compatible modem should you a one of those. Printer support is provided through the CoCo's standard serial port. Finally, forum or mail messages may be typed into the buffer of *MikeyTerm* and then uploaded when you're online. This will save you connect time charges, since you won't have to type everything while you're online.

MikeyTerm (in ASCII BASIC form) is available for downloading from the CoCo SIG's database using your Modem Pak, or it may be obtained directly from its author for the cost of media and handling. For *MikeyTerm* and full documentation, send $10 to:

Mike Ward
1807 Cortez
Coral Gables, FL 33134

(Please specify the tape version.) *MikeyTerm* supports all versions of the CoCo, and includes provisions for Xmodem file transfers. If you decide to upgrade to disk operation in the future, *MikeyTerm* also supports disk I/O in the same program.

The Xmodem protocol is in widespread usage these days on virtually all information services and BBSs. In addition, several terminal programs for the CoCo are available that support Xmodem for cassette users. Inherent in the Xmodem protocol is the ability to transfer binary files, and this created a rather severe problem for cassette users who attempted to download machine language programs or compressed (tokenized) BASIC programs created on a disk system. This is due to a simple incompatibility between the tape and disk file formats. Microsoft, the authors of the BASIC used by the CoCo, only provided for the free exchange of ASCII programs between tape and disk systems. The solution is simply a bit of specialized processing in order to get around the problem. Just for background, let's examine each of the file types.

Machine Language Programs

Specifically, machine language files on disk contain embedded control information that is not part of the actual program. This makes such files incompatible with cassette systems unless that control information is removed. Cassette users who have downloaded and tried to execute binary music files have experienced this problem.

A machine language file on disk is

stored as one large block, and looks something like this:

Preamble

Zero Byte
# of Bytes to load
Loading address

Data

Program body

Postamble

&HFF Byte
2 Zero Bytes
Execution address

However, a machine language program on tape contains a "namefile" block that precedes the machine language program, and it also contains the loading and execution addresses for the program. (BASIC determines the ending address of the machine language program by counting the number of bytes it loads.) The problem is that terminal programs only load the data blocks following the namefile block, so the receiving terminal program has no way of determining these addresses when it saves the received program to tape. To further compound the problem, the Xmodem protocol was never designed to handle this situation, so the tape user was in need of some specialized help. That help arrived over three years ago in the form of a program called TAPCNV.

TAPCNV is a machine language utility written by Mike Ward that will read a machine language cassette file created on a disk system and remove the disk control information. Once that is done, the file may be saved just like any other machine language file.

To create the machine language program TAPCNV, carefully type in and then run Listing 1. (Be sure to save the program first.) The machine language program will be poked into memory, and some checking is done to try to detect any typing errors. Then the program will ask you for a cassette, and it will save the machine language program for you.

To use the TAPCNV program, just load and execute it. It will prompt you to ready the cassette with the tape containing the binary file that you downloaded and wish to convert. When you strike a key, TAPCNV will read the cassette file and remove the disk control information. The converted file will be moved to its proper place in RAM. When the file has been converted, the start, end and execute addresses are displayed. At this point you may save the converted program to cassette by entering a command such as CSAVEM *"filename"*, &H*Start*, &H*End*, &H*Exec*.

Naturally, machine language programs that utilize disk functions will not work on a cassette system, but programs such as music files will now function as intended.

There are some files that TAPCNV simply can't handle, such as "segmented" files. For purposes of simplicity, consider segmented files to be program segments that must be loaded into different areas of memory. A tape format doesn't exist for segmented files, nor is it possible to create such files from BASIC. Segmented files occur regularly on disk systems, however; Disk BASIC can handle them efficiently.

The BASIC version of the TAPCNV program may also be downloaded from the Utilities topic of the CoCo SIG's database on Delphi, and the assembly language source code for TAPCNV may be found in the Source code topic of the database.

Now, since you have TAPCNV but not *MikeyTerm* (yet), can you use the Modem Pak to download machine language programs from Delphi? Sure! We'll have to modify TAPCNV first, in order to remove some checking that "TAPCNV" does to make sure that it is "fixing" a machine language file.

A simple modification to TAPCNV will disable the checking. Just enter CLOADM "TAPCNV", then enter from the keyboard:

```
POKE &H6DE,&H21 : POKE
&H6E5,&H21
```

These pokes make TAPCNV ignore the file type of the source program. Normally, TAPCNV requires a binary file and will cease execution if the filetype isn't binary. These pokes modify some of the "error trapping" features of the program, so they are provided on a "use at your own risk" basis.

Tokenized BASIC

When we say a program is "tokenized" or "compressed" BASIC, we mean that it's in the same form that would be created if you typed in a BASIC program from the keyboard and then entered CSAVE *"filename"*. What BASIC will do is replace keywords like PRINT or PAINT with one character, or "token." Since several characters are replaced with a single character, the term "compressed" BASIC was born. The word "tokenized" is probably more appropriate.

BASIC does this in order to save space and to make program execution faster. Every time BASIC encounters a token, it executes code that already exists in your computer. Whenever you have a BASIC program in your computer, it exists in tokenized format.

The only other way to store a BASIC program is in ASCII format, which you can do by typing CSAVE *"filename"*,A. The A at the end of that line is what tells your computer to save the program to tape in ASCII (or "text") format. When we say ASCII and/or text, we mean the type of characters you see on the screen when you tell BASIC to list a program.

You might experiment with a few of your programs. Take a BASIC program you've saved to tape, and load it into *MikeyTerm*'s buffer. Then view the buffer — you'll see all sorts of colored blocks and some characters mixed in, too. Then take a BASIC program that's been saved in ASCII format (CSAVE *"filename"*,A) and load it into the buffer. When you view the buffer this time, you'll be able to read everything there.

A problem similar to the one involving machine language files causes tokenized BASIC files originating on a disk system to be incompatible with tape systems. BASIC programs saved on disk contain a 3-byte preamble that is not part of the actual program. (Disk BASIC uses this information to determine the size of the BASIC program before loading.) This preamble is not present on BASIC programs on cassette, and it makes such files incompatible with cassette systems unless it is removed. Cassette users who have downloaded and tried to use compressed BASIC files created on a disk system (such as those in the Rainbow topic of the CoCo SIG's database) have repeatedly encountered this problem.

Following Mike Ward's lead, I wrote a utility program to assist tape users with tokenized BASIC programs. BASFIX is a utility that will read a tokenized BASIC cassette file originating on a disk system and remove the control information. It will then prompt the user to save the program to cassette.

BASIC programs utilizing disk functions will still not work on a cassette system, but programs such as the RAINBOW ON TAPE files in the CoCo SIG's database will now be accessible to tape users. In fact, BASFIX was originally written for use with *MikeyTerm* in order to get around the problem of tokenized BASIC programs and cassette users.

BASFIX is compatible with the CoCo 1, 2 and 3. If a CoCo 3 is in use, the screen will default to the 32-column mode automatically, and the processor speed will be adjusted to the normal 0.89-MHz clock rate so that the file may be loaded correctly from tape.

To create the machine language program BASFIX, carefully type in and then run Listing 2. (Be sure to save the program first.) The machine language program will be poked into memory, and some checking is done to try to detect any typing errors. Then the program will ask you for a cassette, and it will save the machine language program for you.

To use the BASFIX program from that point on, simply load and execute it. It will prompt you to ready your cassette player with the tape containing the binary file you downloaded and wish to convert. When you strike a key, BASFIX will read the cassette file and remove the preamble. The converted file will be moved into RAM just as if you had entered PCLEAR 1 and then CLOADed the program. At this point, you will be prompted to CSAVE the converted program to cassette. From then on, the program may be treated just as any other BASIC program from tape.

Note that BASFIX requires that the cassette file containing the BASIC program has been saved in binary format. This is a technical limitation; it was done to prevent several problems that might occur with an ASCII save of the file, since BASIC actually does a LIST to tape when the ASCII option is used. This procedure could result in extremely long program lines being truncated.

If you are using *MikeyTerm*, simply choose Option 2 (Binary save) from the cassette menu. When prompted for the start and execution addresses, you may simply press ENTER in response to the prompts.

BASFIX is entirely position-independent and may be loaded anywhere in RAM. However, it is strongly recommended that the program be executed at its intended location in order to provide maximum memory for the converted BASIC program.

The BASFIX utility program (in ASCII BASIC form) may be downloaded from the Utilities topic of the CoCo SIG's database. The assembly language source code for BASFIX may be found in the Source topic of the database. The source code is written for the MACRO 80C assembler and is listed under the name of BASFIX.SRC.

The TAPCNV and the BASFIX programs, their source code files, and their documentation files are copyrighted by their respective authors. However, they may be freely shared with any and all CoCo users and included in club libraries as long as no fee is charged for the program(s). (A small charge for the media and/or xeroxing fee for the documentation is perfectly OK.)

Feel free to contact either me (Delphi username DONHUTCHISON) or Mike Ward (Delphi username MIKEWARD) with any questions you may have concerning these two utilities. See you on Delphi, and enjoy downloading! □

Listing 1: TAPCNV

```
1 CLS
2 IF PEEK(&HØØØ)=68 THEN PRINT"
DO NOT RUN THIS ON A DISK SYSTEM
":END
3 PRINT@194,"GENERATING MACHINE
LANGUAGE"
4 FOR X=&HØØ TO &H92C
5 READ H$:POKE X,VAL("&H"+H$)
6 NEXT
7 PRINT:PRINT"PREPARE CASSETTE T
O SAVE TAPCNV"
8 PRINT"PRESS ANY KEY WHEN READY
."
9 IF INKEY$="" THEN 9
1Ø CSAVEM"TAPCNV",&HØØ,&H92C,&H
ØØ
11 PRINT:PRINT"TAPCNV SAVED!":PR
INT
12 END
13 DATA 7F,FF,4Ø,6F,8D,3,29,6F,8
D,3,24,8E,Ø,Ø,AF,8D,3,1F,3Ø,8C,E
B,3Ø,89,FD,FF,AF,8D,3,16,3Ø
14 DATA 8D,4,16,AF,8D,3,1Ø,BD,A9
,28,8E,4,45,9F,88,17,2,B6,54,41,
5Ø,45,2Ø,43,4F,4E,56,45,52,54
15 DATA 2Ø,55,54,49,4C,49,54,59,
Ø,8E,4,82,9F,88,17,2,99,52,45,41
,44,59,2Ø,54,41,5Ø,45,2Ø,54,4F
16 DATA 2Ø,42,45,2Ø,43,4F,4E,56,
45,52,54,45,44,Ø,8E,4,C9,9F,88,1
7,2,76,5Ø,52,45,53,53,2Ø,41,4E
17 DATA 59,2Ø,4B,45,59,2Ø,Ø,BD,A
1,B1,81,3,26,1,39,BD,A9,28,96,68
,A7,8D,2,9D,86,FF,97,68,C6,1
18 DATA BD,A9,9E,CC,Ø,F,8E,1,DA,
A7,8Ø,5A,26,FB,3Ø,8D,2,83,17,2,4
8,8E,1,DA,9F,7E,BD,A7,1,DA
19 DATA 7C,26,F9,86,46,B7,4,Ø,B6
,1,E2,A7,8D,2,6B,86,8Ø,B7,1,E2,8
E,1,DA,17,2,25,A6,8D,2,5C
2Ø DATA B7,1,E2,BD,A7,E9,B6,1,E2
,81,2,1Ø,26,1,E8,7D,1,E3,1Ø,26,1
,E1,3Ø,8D,2,4B,34,1Ø,BD,A7
21 DATA 7C,35,1Ø,9F,7E,BD,A7,B,1
Ø,26,1,BØ,6D,8D,2,2F,27,E,AC,8D,
2,2F,22,8,AC,8D,2,27,1Ø,22
22 DATA 1,3Ø,D6,7D,6D,8D,2,19,26
,39,63,8D,2,13,6D,8D,2,17,1Ø,26,
1,52,33,8D,2,F,1Ø,AE,43,1Ø
23 DATA AC,8D,2,3,25,9,1Ø,AC,8D,
1,FE,1Ø,25,1,5,1Ø,BF,1,E7,33,45,
34,4,CØ,5,1F,21,3A,A6,CØ
24 DATA A7,AØ,5A,26,F9,35,4,34,1
Ø,AE,8D,1,DA,3A,AF,8D,1,D5,35,1Ø
,96,7C,81,FF,26,8F,34,1Ø,BD,A7
25 DATA E9,BD,A9,74,35,1Ø,6D,8D,
1,BE,26,52,C6,FF,1F,12,EE,3B,11,
83,FF,Ø,27,3D,EE,8D,1,AD,33,5F
26 DATA EF,8D,1,A7,31,3F,5A,26,E
9,17,1,54,D,D,55,4E,41,42,4C,45,
2Ø,54,4F,2Ø,44,45,54,45,52,4D
27 DATA 49,4E,45,D,45,58,45,43,2
Ø,41,44,44,52,45,53,53,Ø,86,FF,A
```

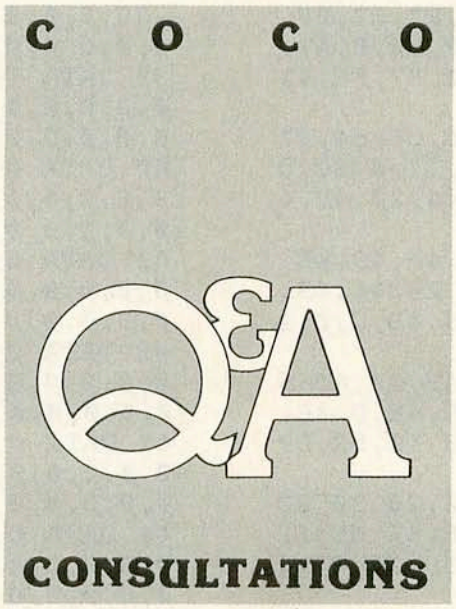
```
7,8D,1,75,2Ø,9,6D,3D,26,BF,AE
28 DATA 3E,BF,1,E5,A6,8D,1,63,97
,68,6D,8D,1,6Ø,27,1,39,31,8D,Ø,4
8,F6,1,E7,17,1,22,F6,1,E8
29 DATA 17,1,1C,31,8D,Ø,52,F6,1,
E5,17,1,12,F6,1,E6,17,1,C,EC,8D,
1,3A,83,Ø,A,FE,1,E7,33
3Ø DATA CB,33,5F,1F,3Ø,34,4,1F,8
9,31,8D,Ø,22,17,Ø,F1,35,4,17,Ø,E
C,17,Ø,DØ,D,D,53,54,41,52
31 DATA 54,2Ø,24,2Ø,2Ø,2Ø,2Ø,2Ø,
2Ø,D,45,4E,44,2Ø,2Ø,2Ø,24,2Ø,2Ø,
2Ø,2Ø,D,45,58,45,43,2Ø,2Ø,24,2Ø
32 DATA 2Ø,2Ø,2Ø,D,Ø,39,17,Ø,A3,
D,4E,45,58,54,2Ø,42,4C,4F,43,4B,
2Ø,57,49,4C,4C,2Ø,4F,56,45,52
33 DATA 2D,57,52,49,54,45,D,54,4
8,49,53,2Ø,5Ø,52,4F,47,52,41,4D,
D,Ø,86,FF,A7,8D,Ø,BD,16,FE,EE
34 DATA 17,Ø,6D,D,46,49,4C,45,2Ø
,44,49,44,2Ø,4E,4F,54,2Ø,4F,52,4
9,47,49,4E,41,54,45,D,4F,4E,2Ø
35 DATA 41,2Ø,44,49,53,4B,2Ø,53,
59,53,54,45,4D,D,Ø,86,FF,A7,8D,Ø
,87,16,FE,B8,17,Ø,37,D,54,41
36 DATA 5Ø,45,2Ø,49,2F,4F,2Ø,45,
52,52,4F,52,D,Ø,86,FF,A7,8D,Ø,6A
,16,FE,9B,17,Ø,1A,D,4E,4F,54
37 DATA 2Ø,41,2Ø,4D,2F,4C,2Ø,46,
49,4C,45,D,Ø,86,FF,A7,8D,Ø,4D,16
,FE,7E,35,1Ø,A6,8Ø,27,5,BD,A3
38 DATA A,2Ø,F7,6E,84,A6,84,84,7
F,BD,A3,A,6D,8Ø,2A,F5,39,34,1Ø,3
Ø,8D,Ø,16,34,4,54,54,54,54,8D
39 DATA 9,35,4,C4,F,8D,3,35,1Ø,3
9,A6,85,A7,AØ,39,3Ø,31,32,33,34,
35,36,37,38,39,41,42,43,44,45
4Ø DATA 46,53,AØ
```

Listing 2: BASFIX

```
1 CLEAR 2ØØ,&H7FFE:CLS
2 IF PEEK(&HCØØØ)=68 THEN PRINT
"DO NOT RUN THIS ON A DISK SYSTE
M":END
3 PRINT@1Ø5,"LOADING basfix":L=1
7:SA=&H6ØØ
4 CK=Ø:L=L+1
5 FOR I=1 TO 32
6 READ H$:IF H$="X" THEN 15
7 PRINT@2Ø6,HEX$(SA)
8 X=VAL("&H"+H$):POKE SA,X
9 CK=CK+X:SA=SA+1
1Ø NEXT I
11 READ I
12 IF I=CK THEN 4
13 PRINT:PRINT"   CHECKSUM ERROR
 IN LINE";L
14 STOP
15 PRINT:PRINT"BASFIX IS LOADED.
 READY CASSETTEAND PRESS <enter>
... ";
16 LINEINPUT A$:CSAVEM"BASFIX",&
H6ØØ,&H98E,&H6ØØ
17 PRINT:PRINT "ALL FINISHED!":E
ND
18 DATA 6F,8D,2,88,6F,8D,2,83,BE
,FF,FE,8C,AØ,27,27,9,7F,FF,D8,F,
E7,AD,9F,EØ,2,17,2,5F,17,2,41,2Ø
,35Ø5
19 DATA 2Ø,2Ø,2Ø,42,41,53,49,43,
2Ø,43,4F,4E,56,45,52,53,49,4F,4E
,2Ø,55,54,49,4C,49,54,59,D,D,D,5
2,45,2Ø42
2Ø DATA 41,44,59,2Ø,54,41,5Ø,45,
2Ø,54,4F,2Ø,42,45,2Ø,43,4F,4E,56
,45,52,54,45,44,D,41,4E,44,2Ø,5Ø
,52,45,2115
21 DATA 53,53,2Ø,41,4E,59,2Ø,4B,
45,59,2Ø,Ø,BD,A1,B1,81,3,26,1,39
,17,2,4,86,53,B7,4,Ø,96,68,A7,8D
,2477
22 DATA 2,8,86,FF,97,68,17,1,24,
3Ø,8D,2,2,9F,7E,CC,Ø,F,A7,8Ø,5A,
26,FB,AD,9F,AØ,4,AD,9F,AØ,6,17,3
1Ø2
23 DATA Ø,FD,D6,81,DA,7C,26,EF,1
7,1,B5,46,2Ø,Ø,A6,8D,1,E5,34,2,8
6,8Ø,A7,8D,1,DD,3Ø,8D,1,D1,17,1,
3328
24 DATA AD,35,2,A7,8D,1,DØ,17,Ø,
D5,A6,8D,1,C9,81,2,1Ø,26,1,3C,6D
,8D,1,CØ,1Ø,26,1,34,AD,9F,AØ,4,2
782
25 DATA 3Ø,8D,1,AB,9F,7E,AD,9F,A
Ø,6,1Ø,26,1,12,6D,8D,1,99,26,36,
63,8D,1,93,31,8D,1,93,63,A4,6D,A
Ø,2971
26 DATA 1Ø,26,Ø,CD,EC,A1,ED,8D,1
,83,C3,C,Ø,9E,17,3Ø,89,FF,Ø,34,1
Ø,1Ø,A3,E1,1Ø,22,1,C,D6,7D,CØ,3,
3Ø63
27 DATA 8E,C,1,A6,AØ,A7,8Ø,5A,26
,F9,96,7C,81,FF,26,B4,8D,6D,8D,7
6,A6,8D,1,52,97,68,6D,8D,1,4E,27
,1,3552
28 DATA 39,7F,C,Ø,CC,C,1,DD,19,E
3,8D,1,4Ø,83,Ø,1,DD,1B,9E,19,EC,
84,27,C,33,4,A6,CØ,26,FC,EF,84,3
148
29 DATA AE,84,2Ø,FØ,9E,27,9F,23,
9E,19,3Ø,1F,9F,33,9E,1B,9F,1D,9F
,1F,8E,1,A9,9F,B,F,2D,F,2E,F,8,1
7,2653
3Ø DATA Ø,DE,D,D,53,41,56,45,2Ø,
```

```
5Ø,52,4F,47,52,41,4D,2Ø,54,4F,2Ø
,54,41,5Ø,45,2Ø,4E,4F,57,D,Ø,39,
1C,2Ø18
31 DATA AF,B6,FF,21,84,F7,B7,FF,
21,39,4F,2Ø,6,C6,1,8D,F,86,8,A7,
E2,B6,FF,23,84,F7,AA,EØ,B7,FF,23
,39,4334
32 DATA CE,FF,1,8D,Ø,A6,C4,84,F7
,57,24,2,8A,8,A7,C1,39,17,Ø,8C,D
,46,49,4C,45,2Ø,44,49,44,2Ø,4E,4
F,2926
33 DATA 54,2Ø,4F,52,49,47,49,4E,
41,54,45,2Ø,4F,4E,D,41,2Ø,44,49,
53,4B,2Ø,53,59,53,54,45,4D,D,Ø,2
Ø,58,2Ø38
34 DATA 8D,5E,D,49,2F,4F,2Ø,45,5
2,52,4F,52,D,Ø,2Ø,48,8D,4E,D,4E,
4F,54,2Ø,41,2Ø,42,49,4E,41,52,59
,2Ø,2Ø77
35 DATA 46,49,4C,45,D,Ø,2Ø,3Ø,8D
,36,D,4E,4F,54,2Ø,45,4E,4F,55,47
,48,2Ø,4D,45,4D,4F,52,59,2E,2E,2
E,D,1972
36 DATA 43,4F,4C,44,2D,53,54,41,
52,54,2Ø,26,2Ø,54,52,59,2Ø,41,47
,41,49,4E,D,Ø,86,FF,A7,8C,2F,16,
FE,DØ,2714
37 DATA 35,1Ø,A6,8Ø,27,6,AD,9F,A
Ø,2,2Ø,F6,6E,84,A6,84,84,7F,AD,9
F,AØ,2,6D,8Ø,2A,F4,39,C6,6Ø,8E,4
,Ø,3493
38 DATA 9F,88,E7,8Ø,8C,6,Ø,25,F9
,39,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,1143
39 DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø
4Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø
41 DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø
42 DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø
43 DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø
44 DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø
45 DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø
46 DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø
47 DATA "X"
```

In this and in future "CoCo Consultations," I will be trying something new. In addition to the familiar Q & A column, I will also include tidbits of information contributed by various folks and, in some cases, comment on the information. Thus, even if you don't have a question, *I invite you to send in any little hints or descriptions of experiences you have had with the CoCo that you think might be of interest to the CoCo-owning public in general.*



By Marty Goodman
Rainbow Contributing Editor

'Sparklie' Solutions

I've been following your discussion of the problem of "sparklies" on the screen when using a Color Computer 3 under OS-9. What can you say to summarize what you know of the problem and its cure?

Daivd Barns
(GLENSIDE)
Glenside, IL

It is true that some CoCo 3s show tiny flashes on the screen, especially under OS-9 and during disk I/O. The "sparklie" problem varies considerably from machine to machine. Some do not seem to have it; others are seriously plagued by it — to the point that the sparklies occur even during Disk BASIC. Sometimes the problem develops after installation of a given brand of 512K upgrade. The sparklie problem appears to be a very subtle timing problem in dynamic RAM addressing. It also appears to vary with the particular issue of GIME chip in the machine, the particular make and model of DRAM chip used for the 512K upgrade, and the heat of the machine. Sometimes the sparklie problem appears only after 20 minutes or more, when the machine has warmed up.

There are primarily two routes to try to fix the problem. Both involve significant expense and/or hardware effort. First, several folks have reported that the sparklie problem is cured by replacing the 68B09 chip in the CoCo 3 with its CMOS cousin, the Hitachi 6309 chip. Unfortunately, this option is limited to skilled hardware hackers. The 68B09 is soldered into the CoCo 3, so you must carefully desolder that 40-pin chip, install a socket, and then obtain and insert the 6309 chip. Such desoldering is rather delicate, and you run the risk of damaging traces to the 68B09 on both sides of the PC board.

The second fix is to replace your GIME chip with a newer model. The older GIME chips are marked copyright 1986. The newer ones are marked copyright 1987. Also, the new GIME chip is named TCC 1014A, whereas the old one is named TCC 1014. Replacing the GIME chip is a delicate process unless you have very specialized tools. It is easy to damage the contacts on the GIME chip or on the socket, or to damage the socket itself. Attempt this replacement only if you know what you are doing, and proceed with great care. Tandy is currently asking $50 for a new GIME chip, which I think is unreasonably high.

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW's CoCo SIG and database manager of OS-9 Online. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

Customized Layout for the CoCo

I am considering putting a CoCo system in an IBM PC-type case. I am contemplating building an expansion board and manually switching +5 volts to each of the various ROMs that might be in cartridges. What do you think of this plan?

F.G. Swygert
APO Armed Forces

Don't try it! A Multi-Pak interface is essential for proper operation of a multislot system, for reasons entirely unrelated to slot selection. First of all, if you put more than half an inch of 40 conductor ribbon cable on the CoCo system bus, your machine will either not run at all or be unreliable.

In addition to slot selection, the Multi-Pak provides TTL buffers on all address and data lines. Those buffers are needed, for the naked output lines of the 6809 cannot be fanned out unamplified to three or four extra cards without causing the machine to either crash or operate very unreliably. Your plan to fan out the bus of the CoCo without using buffers would not work.

Finally, an IBM PC-type box is a relatively poor choice for repackaging a custom CoCo because it is the wrong shape. In order to shoehorn an extensive CoCo system into such a box, you'd have to use signficant lengths of ribbon cable on the 40 conductor system bus. That, as I noted above, is unacceptable. Frankly, having done such a repackaging job several times myself, I really urge you to abandon the idea entirely. It is *not* in my opinion worth the effort.

The same effect can be achieved far more easily by merely mounting a CoCo and Multi-Pak off to the side of, above, or below your work area, and then putting the keyboard at the end of an extender cable and into a case for placement on your work area or (for the sake of your back) on your lap. I make such a cable for use by tinkerers and do-it-yourselfers; it is sold by Microcom Software. It also has provisions for a remote reset and power-on light. For about twice the price, HJL sells what appears to be an excellent package that includes a plug-in keyboard cable, an extremely well-designed remote keyboard case, and one of its excellent CoCo replacement keyboards. I'd recommend my system to those who want

to save a little by making their own keyboard case, and HJL's to those who prefer to buy something that plugs right in and can be immediately used.

In any case, whether you buy my cable, HJL's system, or make up your own extension keyboard cable, leave the CoCo + Multi-Pak + plugged-in cards setup alone, and put it out of the way via an extension keyboard. In my opinion, this is by far the best approach to customizing your CoCo's physical layout for more convenient operation.

FD 502-Related OS-9 Crashes

See pg 184

The FD 502 series drive is wired up in a peculiar way, rather differently from any of the preceding drive units from Tandy for the CoCo. With all other drive systems from Tandy, when you accessed any one drive, all the drive motors were turned on. With the FD 502 system, if you have two drives, when you access any one of them the other drive motor is not turned on. In this respect, the FD 502 works like the drives on an IBM PC. But this causes serious problems with OS-9 in operations where a user is copying from one drive to another. OS-9's driver software does not wait for the second drive to come up to speed because it "thinks" that the drive's motor was already turned on at the time the first drive was accessed. The result is occasional crashed disks due to the drive starting to write before the head has come up to speed. I understand Tandy may release patches for the OS-9 disk drivers to correct this problem. The patches would contain code that pauses for a fraction of a second each time a new drive is selected to wait for the motor on that drive to come up to speed.

Kevin Darling
(KDARLING)
Raleigh, NC

Thanks for alerting us to this potential problem, Kevin. Note that knowledgeable hardware hackers should be able to carefully check out the wiring of the motor-on and drive select lines in the FD 502 and redo the wiring so that all motors in the system do go on when any one drive is accessed. Though I have not looked much inside the FD 502, I would imagine the problem is that, as delivered, the motor-on line and the drive select line are tied to the same pin, or linked logically so that the motor-on signal will only be seen as valid if the drive in question is also selected. A bit of hacking should be able to cure this, if the hackers know what they are doing.

Note, also, that the FD 502 will also have similar problems with Disk Extended BASIC: Programs that do two-drive operation, particularly disk backup operation, will result in occasional crashed sectors on an unmodified FD 502 drive system, for the same reasons there are problems with it under OS-9. These problems will be disastrous, but sufficiently infrequent as to be maddening to someone looking for the cause.

It is also interesting to me that this very subtle problem is extremely similar to an equally subtle problem that I christened the "head settle bug," which plagues owners of drives that have head solenoids. Many years ago I described this bug and a patch to the Disk BASIC ROM for it in the magazine *HOT CoCo* — one of the first CoCo articles I ever wrote. I now recommend that any owners of older head solenoid drives disable that function by merely selecting the HM options, which keeps the head down all the time.

From ROM Pack to Disk

How can I put the ROM packs Thexder *and* Shanghai *on disk? I am tired of plugging and unplugging my disk controller whenever I want to play the games, and all the available slots in my Multi-Pak are used up with OS-9-related hardware.*

Dennis McMillian
Pittsburg, CA

First, you need to know how to transfer the "raw file" from the ROM pack to tape. *This* is accomplished by first putting a tiny piece of tape *only* over Trace 8 on the ROM pack. Trace 8 will be the first pin you encounter on the underside of the ROM pack, near (but on the *opposite* surface of the edge connector) that one slightly shortened trace. Note that traces 2, 4 and 6 are missing on these ROM packs, so Trace 8 is the first one you encounter. Cover this and *only* this trace with a bit of frosted "magic tape."

Now, with the power off, plug in the ROM pack and then turn the power on. The pack will now *not* autoexecute because of the covered trace, so you will be greeted by the ordinary Extended BASIC sign-on message. Now type `POKE &HFFDE,0` and press ENTER. Connect your cassette tape recorder and save contents of the the ROM pack to disk using the command `CSAVEM "filename", &HC000, &HFEFF, &HA027`. The *filename* can be `THEXDER` or `SHANGHAI`, whichever one you are working on.

Now turn the power off, remove the ROM pack, and replace it with the disk controller. Power up again.

For *Shanghai*, load the tape into your Disk BASIC system using the command `CLOADM"SHANGHAI", &H7000` and press ENTER (*assuming* you named the cassette file as `SHANGHAI`, of course). This command will offset-load the data into lower RAM memory. Now modify the data by entering this:

```
POKE &H303C, &H7E
POKE &H303D, &H30
POKE &H303E, &H56
```

Now save the data to disk as follows:

```
SAVEM "SHANGHAI", &H3000,
&H6EFF, &H3000
```

You'll now have a disk file of *Shanghai* that you can load and execute.

For *Thexder*, load the tape using the command `CLOADM "THEXDER", &H6000` (assuming you named the cassette file as `THEXDER` when you saved it to cassette). Modify the data by entering the following:

```
POKE &H20BF, &H20
POKE &H20C0, &H0F
POKE &H2102, &HDF
POKE &H2104, &H20
POKE &H4BB5, &H50
POKE &H4BE3, &HAF
```

Now save the modified data to disk with the command `SAVEM "THEXDER", &H2000, &H5EFF, &H2000`.

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P.O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

Questions can also be sent to Marty through the Delphi CoCo SIG. From the CoCo SIG> prompt, pick Rainbow Magazine Services, then, at the RAINBOW> prompt, type ASK (for Ask the Experts) to arrive at the EXPERTS> prompt, where you can select the "CoCo Consultations" online form which has complete instructions.

Sugar Software

☞ Calligrapher Combo Special - Save $14.95 ☜

Order either the OS9 or RSDOS CoCo Calligrapher Combo, which includes the Calligrapher and the two Economy Font Packages, and you will receive the small Font Set #7 **free**! A total of 59 fonts for only **$69.95**.! This special offer is available through September 30, 1988.

CALLIGRAPHER

CoCo Calligrapher - (Hybrid BASIC/ML) Turn your CoCo and dot-matrix printer into a calligrapher's quill. Make beautiful invitations, flyers, certificates, labels and more. Includes 3 fonts: *Gay Nineties, Old English* and *Cartoon*. The letters are ½ inch high and variably spaced. Works with many printers including Epson, Gemini, Radio Shack, Okidata 92A, Banana and Prowriter. Additional fonts are available (see below). Tape/Disk; **$24.95**.

OS9 Calligrapher - (C) Although a different program from the CoCo Calligrapher, the OS9 Calligrapher *prints* all the same fonts. It reads a standard text file which contains text and formatting directives. You may specify the font to use, change fonts at any time, centering, left, right or full justification, line fill, margin, line width, page size, page break and indentation. Similar to *troff* on UNIX systems. Includes Gay Nineties, Old English and Cartoon fonts. Additional fonts are available (see below). Disk only; OS9 Level I or II; **$24.95**.

Calligrapher Fonts - Requires Calligrapher above. Each set on tape or disk; specify RSDOS or OS9 version; **$14.95** each. **Set #1** - (9 fonts) Reduced, reversed and reduced-reversed versions of Gay Nineties, Old English and Cartoon; **Set #2** - (8 fonts) Old Style and Broadway; **Set #3** - (8 fonts) Antique and Business; **Set #4** - (8 fonts) Wild West and Checkers; **Set #5** - (10 fonts) Stars, Hebrew and Victorian; **Set #6** - (8 fonts) Block and Computer; **Set #7** - (5 *small* fonts) Roman, Italics, Cubes, Digital and Old World.

Economy Font Packages on disk; specify RSDOS or OS9; **29.95**: **Font Package #1** - Above font sets 1, 2 and 3 (25 fonts) on one disk. **Font Package #2** - Above font sets 4, 5 and 6 (26 fonts) on one disk. Both Packages #1 and #2 (51 fonts) on one disk; **49.95**.

Calligrapher Combo Package - Includes the Calligrapher and both Economy Font Packages, 54 fonts in all; specify RSDOS or OS9; **$69.95.** *See special offer above.*

Sample Calligrapher fonts

INFORMATION MGT.

TIMS (The Information Management System) - (Hybrid BASIC/ML) Tape or disk, fast and simple general data base program. Create *files* of *records* that can be quickly sorted, searched, deleted and updated. Powerful printer formatting. Up to 8 *user* fields, sort on up to 3 fields. Tape/Disk; **$19.95**.

TIMS Mail - (Hybrid BASIC/ML) Tape or Disk based mailing list management program. Files are compatible with TIMS. Fast and simple to use. Supports labels 1, 2 or 3 across, 2½ to 4 inches wide. Tape/Disk; **$19.95**.

TIMS Utility - (Hybrid BASIC/ML) Utility companion for TIMS and TIMS Mail for multi-term search (*AND* and *OR* logic), global change and delete, split large files and more! Tape/Disk; **$14.95**.

TIMS Combo Package - All three of the above programs: TIMS, TIMS Mail and TIMS Utility on one disk - **$34.95**.

UTILITIES

OS9 Patcher - (C) Display and modify the contents of a file or memory module. Search for value or string. Calculates module CRCs; Disk only; OS9 Level I or II; **$19.95**.

Color Disk Manager - (100% ML) Disk utility with these features: Disk repair, selective track initialization, verify sectors, backups, tape to disk transfer, ROM Pak execution from disk, much more! Tape/Disk; CoCo 1, 2, 3 (except for 64K mode); **$24.95**.

EDUCATIONAL

Trig Attack - (100% ML) Ages 9 and up. In this educational arcade game, enemy *trigs* travel along math curves. Players learn important mathematical concepts as they play. Sound effects, colorful graphics. Excellent manual includes an introduction to trigonometry. Tape 16K CB/Disk 32K ECB; CoCo 1, 2, 3; **$19.95**.

The Educational Combo - The Combo includes these educational (and entertaining) games:

Silly Syntax (ages 5 and up) story creation game with 2 stories

Galactic Hangman (ages 7 and up) animated graphics, with a 700 word vocabulary

The Presidents of the USA (ages 10 and up) a presidential trivia game

The Great USA (ages 9 and up) a trivia game of the states

Trig Attack (ages 9 and up) Zap those *Trigs*

All five programs on one disk; **$49.95**.

SPECIAL INTEREST

Rental Property Income and Expense Management Package - Maintain your rental property income and expense records. Print output supported. 28 expense categories. *This program may be tax deductible.* Disk only; **$29.95**.

CoCo Knitter - Easy to use program to display or print instructions to knit a sweater: Cardigan or Pullover; Round or V-neck; Raglan or Set-in Sleeve; 3 weights or yarn; 8 sizes from baby to man. Tape/Disk; **$19.95**.

RAINBOW CERTIFICATION SEAL

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SUGAR SOFTWARE
P.O. Box 7446
Hollywood, Florida 33081
(305) 981-1241

All programs run on the CoCo 1, 2 and 3, 32K Extended Basic, unless otherwise noted. Add $1.50 per tape or disk for shipping and handling. Florida residents add 6% sales tax. COD orders add $5. Dealer inquiries invited. Orders generally shipped in 24-48 hours. No refunds or exchanges without prior authorization.

I am looking for techniques or programs that allow BASIC programs to be transferred from CoCo to IBM. I realize that most programs will have to be edited, but that is better than keying them in. Would saving the BASIC programs as ASCII files on the CoCo, then making the transfer by a null modem cable or the phone lines work?

David Johnstone
Torrington, CT

Rx As you suggested, saving the programs in ASCII is the first step. Making the transfer with a null modem and a communications program on each would work (e.g., *Mikeyterm* on the CoCo, *ProComm* on the IBM). The commercial program *CoCoUtil* allows the IBM to read, write and format Color Disk BASIC files. Marty Goodman published programs to transfer files between IBM and CoCo disks in "The Great Transformation" in the June 1986 RAINBOW and "Transfer CoCo Files To MS-DOS Disks" in the July 1987 issue. Using D.P. Johnson's *SDisk3*, you can add Clearbrook Software's MS-DOS driver to OS-9 Level II. Using files from the OS-9 SIG on DELPHI — GREGL's AR and IPATCH.AR, and BRUCEISTED's PCDOS.AR, RSDOS.AR and CC3DISK.AR — you can enable OS-9 Level II to read and write disks in the IBM-PC and Disk Color BASIC formats.

A Bug in BASIC?

Happily pecking away at my computer the other day, I decided to enter a program from THE RAINBOW. After typing it in, I tried to run it. The computer gave me an "FC Error in Line 15." That line contained PMODE4,1. *I tried every combination of* PMODE *I could think of, always with the same results: "FC Error." I closed the computer and then reopened it; after that it accepted* PMODE *quite happily. What happened? I have a CoCo 3 and BASIC 2.1, and I never had that problem before. Should I bundle up my CoCo and head to Radio Shack? Is it a bug in BASIC?*

Christiane Tom
Quebec, Canada

Rx On power-up the CoCo 3 copies all its ROMs into RAM — including BASIC. If you load and run a BASIC program that contains pokes and typographical errors, BASIC can be altered so that it malfunctions. Even after you fix your BASIC program, the CoCo's BASIC interpreter may still contain poked bugs that will remain in effect until you power down and reboot the machine. Since the problem has not recurred, this seems like a logical explanation.

Changing Characters

In the March '88 issue of THE RAINBOW, Bill Barden had an article locating the CoCo 3's HPRINT *character table in memory and telling how characters can be changed to your taste. Where is the table for the regular text screen characters, and can they be changed also?*

Tim Fultz
Bonneau, SC

Rx The "regular" text characters were in the SAM chip on the earlier CoCos and are in the GIME chip on the CoCo 3. In both cases, they are not in RAM and therefore cannot be altered with software.

Paint and Printer Don't Mix

I have Tandy's DeskMate 3 *Version 1.00 and am unable to print a picture I drew on the screen using* DeskMate*'s Paint feature. All I get is garbage. The other features of* DeskMate *print out without any problems and with no modifications to the program or printer. I have a 128K CoCo 3, Multi-Pak Interface (modified by Radio Shack), Tandy CM-8 color monitor, Tandy FD 501 disk drive and a Star NX-10 dot matrix printer.*

George Masek
Maryville, TN

Rx With the exception of *DeskMate 3*'s Paint feature, the other features perform only ASCII text printing, which is pretty much a standard across all printer lines. The Paint feature, on the other hand, was written by Tandy to use the 7-dot graphics drivers built into its own LP and later DMP printer lines. The Star printer you have uses IBM's 8-dot graphics and is incompatible with Tandy's graphics driver.

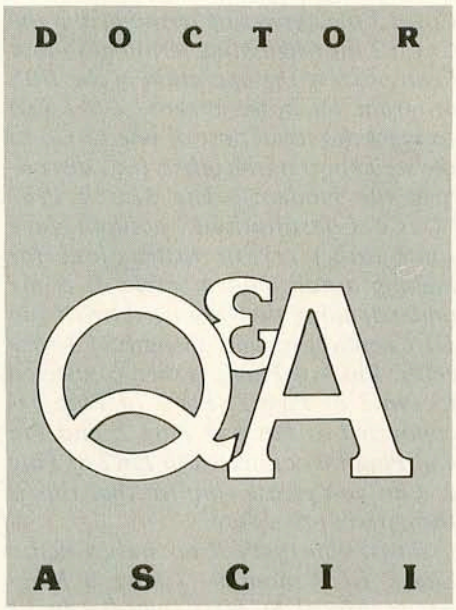
Memory Locations and Dual Speed

The 128K CoCo 3 has memory locations &H70000 *to* &H7FFFF. *Why, then, is it possible to access memory locations below* &H70000*? For instance, with the high speed poke I discovered another location by poking values into locations* &H400 *through* &H5FF, *which caused characters to appear on the Lo-Res text screen, although the Lo-Res text screen memory location is* &H70400 *through* &H705FF.

Also, when OS-9 Level II is initialized on the CoCo 3, at what speed is the CoCo 3 running, 0.894 or 1.788 MHz? How do you switch speeds in OS-9 Level II? Radio Shack's catalog says OS-9 Level II supports dual speed on the CoCo 3, so both speeds should be available.

Bruce Arsenault
Nova Scotia, Canada

Rx On the CoCos 1 and 2, the address space was 64K ranging from $0000 to $FFFF. Direct access to mem-



By Richard E. Esposito
Rainbow Contributing Editor
with Richard W. Libra

Richard Esposito is the principal engineer for BDM Corporation. He holds bachelor's, master's and doctorate degrees from Polytechnic Institute of Brooklyn. He has been writing about microcomputers since 1980.

Richard Libra is a simulator test operator for Singer Link Simulation Systems Division.

ory addresses was accomplished in BASIC with peeks and pokes. To maintain compatibility with programs written for earlier machines, peeks and pokes on the CoCo 3 access the 64K addresses $70000 to $7FFFF "normally accessible" to BASIC by using CoCo 3 extended addressing terminology. If you prefer using extended addresses, the CoCo 3 has the additional functions LPEEK and LPOKE. To give an example, POKE&H0500 is the same thing as LPOKE&H70500.

OS-9 Level II normally operates at 1.788 MHz. You can switch speeds by writing to the GIME registers at $FFFD8 (slow) and $FFFD9 (fast).

Logon Problems

I am having problems logging on to Delphi — or any other BBS system, for that matter. I am working with a CoCo 2 64K ECB disk and tape. I recently ordered Autoterm 3.2T, *which is no help either. I have the Deluxe RS-232 Program Pak, and I'm using the TRS-80 Modem IB (Part Number 1175). My problem is that every time I connect, everything from the host computer comes back to my screen so garbled I can't understand it. I recently had a new telephone line put in my den just for computer communications, and I got the "no-frills" service: no call waiting, rotary line service, etc. Could that be the problem? Would logging on work better with digital service?*

Cardell Stevenson
Philadelphia, PA

Rx Unless the quality on rotary dial lines in Philadelphia is much worse than elsewhere, I don't think that's the problem; I use rotary dial lines at 2400 baud with no problem. Your problems are more likely the wrong baud rate, type of parity or number of stop bits set with your communication software or hardware.

Colorless CoCo 3?

Now that I have a CoCo 3 with an RGB monitor, many of the programs I keyed in from THE RAINBOW on my old CoCo 2 with a color TV screen no longer give a color display, appearing instead in black and white. A friend told me that this is because the RGB monitor does not show the artifact colors you get with the color TV. Is this the case, and is there any kind of a routine I can key in on the CoCo 3 that will let me run these old programs and get the colors I got with the CoCo 2 and the color TV?

Also, I would like to try out the BBS program I keyed in from the November 1987 issue of THE RAINBOW, making the CoCo 3 the answering terminal and the CoCo 2 the originating terminal so that I can observe the operation of the BBS program on both screens. Do I just connect the serial port of one CoCo to the serial port of the other, (i.e., disconnect the modem)? The March 1987 "CoCo Consultations" column gave some rather cryptic instructions for making a null modem cable. It is my understanding that you need two 4-pin DIN connectors and a length of 3-wire cable. Pin 3 of Plug 1 is then connected to Pin 3 of Plug 2; Pin 2 of Plug 1 is connected to Pin 4 of Plug 2; and Pin 4 of Plug 1 is connected to Pin 2 of Plug 2. Can you please confirm that this is the correct procedure?

Please note that I do not have a Radio Shack RGB monitor. I have a Magnavox Model 8CM515, which can be used in RGB or composite mode. I've been using it in RGB mode.

Charles Roman
Skokie, IL

Rx With your Magnavox 8CM515 you also need to make the composite video connection, using a cable with phono jacks at both ends. Then when you want to view artifacting colors, push the CVBS button under the flip panel on the front of your monitor.

Your description of the null modem cable is fine.

An Address and an 80-track Drive

Do you know the address for Mikeyterm *so I can get it on OS-9?*

Also, what kinds of 80-track 5¼-inch drives are available?

Allen Martin
Holbrook, MA

Rx *Mikeyterm* author Mike Ward's address is 1807 Cortez, Coral Gables, FL 33134. Incidentally, *Mikeyterm* runs only under Disk BASIC. It is not designed to work with OS-9.

The only 80-track drive I would consider is the TEAC 55F. The older ones have a jumper marked DS that can be set for 40- or 80-track operation. I prefer to replace the DS jumper with a DPST switch, giving me hardware selection of 40- or 80-track operation. The newer TEAC can be similarly configured by adding a resistor (10 ohm) in line with an SPST switch to the solder pads marked "R15." I recently found out there is yet a newer version of these drives with two large square ICs. (The older drives had only one.) The newer drives require a 100 ohm resistor with a switch connected to the solder pads marked "R19."

Replacement Generator

I've been told that the 6847-T1 VDG mentioned in your January 1988 column has been discontinued. Is this true? If not, where can I purchase one, and how much can I expect to pay? If it is true, can another type be substituted?

T. Anthony Ertl
Colbert, WA

Rx Although it is no longer manufactured or readily available, I believe you can still order one as a replacement part for a Korean CoCo 2. The price is approximately $15 from Radio Shack National Parts.

Shifted Display

I am using my new Magnavox 8CM515 monitor with Greg-E-Term *to write this letter. I am using a CoCo 3 in 80-column mode; for some reason my display is shifted all the way to the left so that the characters on the extreme left are barely legible, yet there is almost three-quarters of an inch available on the right. Why is that? Is there an adjustment I can make to correct this situation?*

Dennis Wood
Indianapolis, IN

Rx Adjust the "horizontal centering" at the left rear of your monitor.

For a quicker response, your questions may also be submitted through RAINBOW's CoCo SIG on Delphi. From the CoCo SIG> prompt, pick Rainbow Magazine Services, then, at the RAINBOW> prompt, type ASK for "Ask the Experts" to arrive at the EXPERTS> prompt, where you can select the "Doctor ASCII" online form which has complete instructions.

Communicating computer-to-computer

All About Serial Packs

By Tony DiStefano
Rainbow Contributing Editor

Communication is important in today's world. We understand what other people are saying because we all know the rules of communication. This set of rules is a sort of English protocol. When we hear the word "apple" (perhaps a bad example!) we immediately think of a red, ball-like object that can be eaten. If you say the word to anyone who knows the English protocol, he or she too will think of a red, ball-like object that can be eaten. This is a form of communication.

A set of rules has to be followed in communicating with a computer, too. This time you cannot use the English protocol, because the computer does not understand that — yet! To communicate with most computers, you have to press a number of switches arranged in a way that is familiar in human communications: the keyboard. We press these switches in an order that makes sense to us, but to the computer this is just a sequence of pressed switches. It compares this sequence to a known sequence in its memory banks. If a match is found, the computer then proceeds according to its programming.

The keyboard is an interface between a person and a computer, but there are times when we want one computer to communicate with another computer in order to transfer some kind of information the user needs or is sending. This computer-to-computer communication also has to follow a certain protocol.

There are many of these, ranging from simple serial communications to high-speed networks to parallel mainframe workstations. The protocol most used in the CoCo is serial. In this case, serial means to transfer data one bit at a time. The CoCo's internal memory is organized in eight-bit chunks called bytes. To transfer one byte of data from one computer to the other serially requires eight bit transfers. But that is just the data. In order to keep errors at a minimum, a start bit and a parity bit must also be included.

The CoCo has no special hardware to communicate in a serial fashion. Instead, it has a few bits on a PIA that is used by the CPU to simulate a real serial port. This makeshift port is limited in speed and performance. Also, with the exception of the CoCo 3, there doesn't seem to be any good software that supports this "bit banger," especially if you want to communicate at 1200 baud. The CPU simply does not have enough time to take care of the serial I/O and still do the rest of its chores. This led Tandy to introduce the Deluxe RS-232 Pak.

Inside it lies the hardware for a real serial port and true RS-232 protocol. At its heart is the Rockwell R6551 ACIA (Asynchronous Communication Interface Adapter) chip. This chip has all the necessary circuitry to interface the parallel data of the CoCo's CPU to the standard RS-232 serial protocol and is capable of baud rates of 50 to 19,200. (Baud rate is the speed at which the bits are transferred.) It is also capable of word lengths from five to nine and has a programmable number of stop bits and parity detection. In fact, it is a great chip for our use. Figure 1 shows the pinout of the R6551; a pin-by-pin description of this 28-pin chip appears in Figure 3 on the next page.

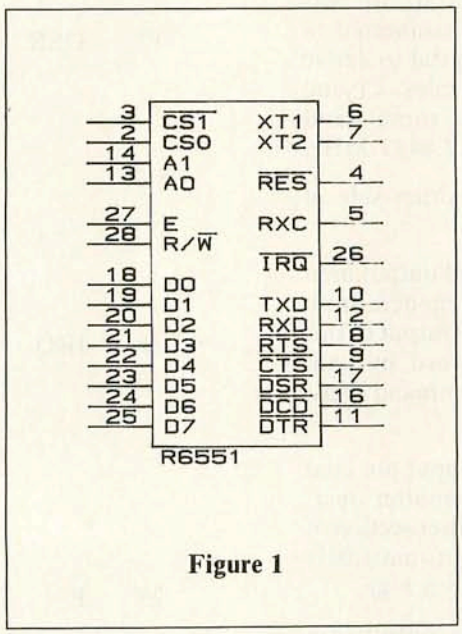
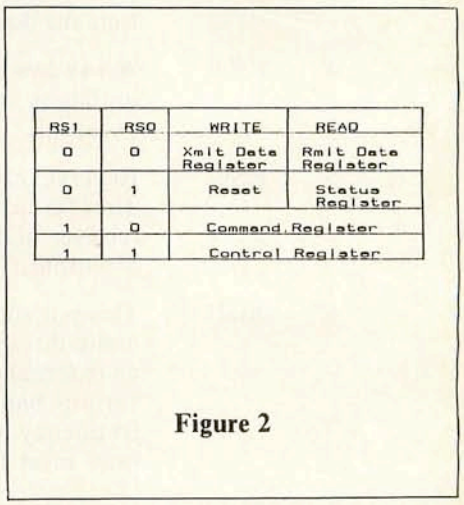


Figure 1



RS1	RS0	WRITE	READ
0	0	Xmit Data Register	Rmit Data Register
0	1	Reset	Status Register
1	0	Command Register	
1	1	Control Register	

Figure 2

From Figure 2, we see that the R6551 has four registers. The first is the data register. This is data going to and from the different computers. The next register is the Control Register. Bits 0 through 3 control the baud rate of the ACIA. Here is a list of the baud rates:

Bits	Baud Rate
3 2 1 0	Generated
0 0 0 0	EXTERNAL
0 0 0 1	50
0 0 1 0	75
0 0 1 1	109.92
0 1 0 0	134.58
0 1 0 1	150
0 1 1 0	300
0 1 1 1	600
1 0 0 0	1200
1 0 0 1	1800
1 0 1 0	2400
1 1 0 0	3600
1 1 0 1	4800
1 1 1 0	9600
1 1 1 1	19200

Tony DiStefano is a well-known early specialist in computer hardware projects. He lives in Laval Ouest, Quebec. Tony's username on Delphi is DISTO.

Bit 4 controls the external clock, with 1 being baud rate and 0 being external. Bits 5 and 6 are word length. 00 is 8, 01 is 7, 10 is 6 and 11 is 5. Bit 7 high is two stop bits, and Bit 7 low is one stop bit.

The next register, the command register, is used to control the specific transmit and receive functions shown in Figure 4.

Pin No.	Name	Description
1	GND	Signal and power ground. All signals are referenced to this pin.
2	CS0	Active low-input chip selects the device. When this pin is low and CS1 is high, the chip is selected.
3	CS1	Active high-input chip selects the device.
4	RES	Active low input resets and initializes internal registers to zero.
5	RSC	Receive clock pin is bi-directional; serves as the receiver of 16X clock input or output.
6	Xtal1	This pin and Xtal2 are normally directly connected to an external crystal to derive various baud rates. Crystal frequency for these baud rates must be 1.8432 MHz.
7	Xtal2	Connected to other side of the crystal.
8	RTS	Request to send output used to control the modem from the processor. Output of this pin is determined by contents of the command register.
9	CTS	Clear to send input pin used to control transmitter operation. Transmitter section of the chip is automatically disabled if CTS is high.
10	TXD	Transmit data output pin used to transfer serial data to the external device. The least significant bit is transmitted first, with rate determined by baud rate selected.
11	DTR	Data terminal ready outpin pin used to indicate status of the chip. A low on DTR indicates the chip is enabled. This bit is controlled via Bit 0 in the command register.
12	RXD	Receive data input pin used to transfer data from the external device.
13	RS0	First of two register select lines connected to CPU address lines. Used to select various internal registers. See Figure 2.
14	RS1	Second of two register select lines. See Figure 2.
15	Vcc	Input is connected to +5 volts. It powers the chip's internal circuits.
16	DCD	Data carrier detect input pin used to indicate to the chip the status of carrier detect output of the external device.
17	DSR	Data set ready input pin used to indicate readiness state of the external device. A low indicates a "ready."
18-25		Data bits D0 through D7, respectively; bi-directional lines used to transfer data to and from the CPU to the chip.
26	IRQ	Interrupt request pin is an open collector (drain) output used to flag the CPU when the chip has finished using data. IRQ status bit allows many pins to be connected to the same IRQ line to the CPU.
27	E	E clock input to this pin used to gate all data transfers to and from the CPU.
28	R/W	Read/write input pin used to control direction of data transfers between the CPU and the chip. A low on the R/W pin allows a write to the chip.

Figure 3

Bits	Description
0	Hi= Enabled DTR
-	Lo= Disabled DTR
1	Hi= IRQ Disabled
-	Lo= IRQ Enabled

3 2	Xmit IRQ	RTS	Other
- -			
0 0	Disabled	Hi	-
0 1	Enabled	Lo	-
1 0	Disabled	Lo	-
1 1	Disabled	Lo	Xmit BRK

4	Hi= Echo
-	Lo= Normal

7 6 5	Operation
- - -	
X X 0	Parity Disabled
0 0 1	Odd Parity
0 1 1	Even Parity
1 0 1	Mark Parity Xmit Check Disabled.
1 1 1	Space Parity Xmit Check Disabled.

Figure 4

The final register is the status register. These bits in the status register indicate to the processor the status of the various R6551 functions as outlined in Figure 5.

Bit	Low	Hi
0	No parity error	Parity error detected
1	No framing error	Framing error detected
2	No Overrun error	Overrun error detected
3	Receive buffer -Not full	Receive buffer -full
4	Transmit buffer -Not empty	Transmit buffer -empty
5	DCD detect	DCD not detected
6	DSR ready	DSR not ready
7	No IRQ	IRQ has occurred

Figure 5

The R6551 is the heart of the pack, but not the only part. Its job is to take the eight-bit data to and from the CPU and transmit it at the right baud rate and parity, but that is not all. This chip has a high level of 5 volts and a low level of ground, or 0, volts. RS-232 standards require that the voltage for serial communications be a high of +12 volts and a low of -12 volts. This is done through two chips known as level shifters. The first, the MC1488, is a shifter that changes 5/0 volt levels to 12/-12 volt levels. The other, the MC1489, does the opposite: It shifts the 12/-12 volt inputs to 5/0 volt.

Other parts include decoders and buffers, resisters and capacitors. Software in a ROM is also included. This software gives the CoCo the ability to communicate with other computers. It is OK as far as "dumb terminals" go, but it lacks the power for good data transfers. Most people use other third-party software to drive this pack.

I have designed an equivalent to the above-described RS-232. It functions the same except that it has no built-in software — no great loss, since most people do not use it. If you are using OS-9, the software driver is already included and is compatible with my pack. For prices and delivery, call CRC at (514) 383-5293.

Hint . . .

Cobble the Step Rate

You can use the `Cobbler` command to tailor what you get in memory when the system disk boots. For instance, if you want a faster step rate as a permanent feature, first make sure that both *Modpatch* and *Cobbler* are on your disk in the commands directory. Then use the `Edit` or `Build` command to create this short program called *Steprate*, which is to be stored in the root directory:

```
L d0
c 14 00 02
V
```

(See Dale Puckett's column in the May '87 issue of THE RAINBOW, Page 201, for various step rate values.)

Play it safe and make a backup copy of the whole disk once you have the step rate file in place. (Caution: A fragmented boot file cannot be cobbled, yet it might not reveal itself until you start the `Cobbler` action. This destroys the disk contents.) Use the backup copy to cobble things into memory. At the OS-9 prompt, call the step rate action by entering `modpatch steprate`. Then with the faster rate in place (you will hear your disk action change), cobble the change into permanency at the OS-9 prompt by entering `cobbler /d0`. You can now delete the step rate file, and know that next time you boot OS-9 it will come online with the change in place.

Del Turner
Kamloops, BC

Barden's Buffer

Can You Survive This Column?

By William Barden, Jr.
Rainbow Contributing Editor

What three terms thrust most fear and loathing into the hearts of CoCo aficionados? No, the answer is *not* "MS-DOS, IBM and OS-9!" I was thinking more along the lines of assembly language, interrupts and BASIC "internals."

If you can bear with me through this column, I'll reveal some of the secrets of these topics. In addition, I'll show you an elegant program that I haven't seen before (although it's undoubtedly been done by someone). As you might guess, the program gets into all three areas. As Nietzsche (or was it G. Gordon Liddy?) might have said, those CoCo topics that don't confound you make you stronger. This column will certainly test your mettle!

The Program

What I have in mind was prompted by a column I read in *Communications of the ACM*. The shining light in this professional magazine is written by Jon Bentley and called "Programming Pearls" — an interesting look at programming problems and topics. Bentley, reminiscent of Martin Gardner and his "Mathematical Games" column in the old *Scientific American*, has the ability to make things simple. In one of his columns Bentley mentions a program that times the component parts of a program so that the user can see how efficient his code is. Although a simple example is given, it got me to thinking: It should be possible to *display* an entire program graphically, with the speed of various parts indicated on the graph. A sample is shown in Figure 1.

How can this be done? One way might be to incorporate a timing routine in each subroutine of the program. The subroutine might be called at entry and exit to record the elapsed time from the CoCo TIMER function. This is kind of messy, though, and doesn't allow you to get any finer resolution than a subroutine, which may consist of many lines.

Bill Barden has written 27 books and over 100 magazine articles on various computer topics. His 20 years' experience in the industry covers a wide background: programming, systems analysis and managing projects for computers ranging from mainframes to micros.

A better idea would be to time each BASIC statement or line. A BASIC statement takes a certain amount of time to execute, of course — on the order of milliseconds (thousandths of a second). The following program takes about 2.5 seconds to execute on a CoCo 3 in slow speed, making each of the 1,000 times through the loop about 2.5 milliseconds.

```
100 FOR I = 1 TO 1000
110 NEXT I
```

How this time is divided between Line 100 and Line 110, though, is anyone's guess. Longer lines and those involving mixed number calculations, division and exponentiation may be dozens of times slower.

One way to time the execution of a BASIC line would be

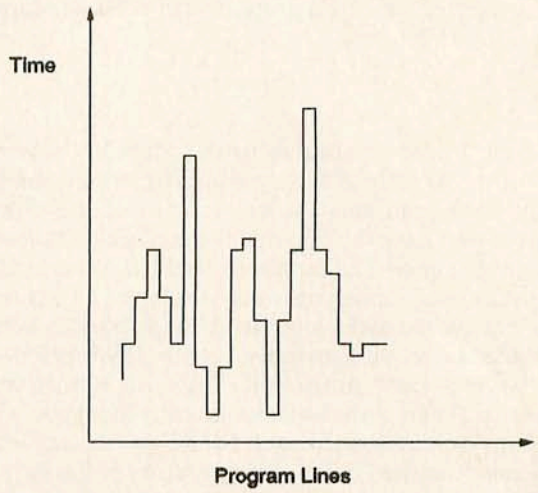


Figure 1: Graphic Display of a Program's Speed

to record the time at the beginning and end of the line. To do that, though, we'd need some hooks in the "internals" of the BASIC interpreter. Another approach is to periodically sample the execution of a program. If the program could be tested every few milliseconds, we could examine which line was executing and tally a mark for that line, as shown in Figure 2. At the end of the program execution, we'd have a tally of the times that each line had executed. Some lines might be missed, but in the long run we'd have a pretty good idea of which program lines took the longest.

It probably won't surprise you to learn that there is a way to perform this sampling. The CoCo has a real-time clock interrupt that occurs 60 times per second. One-sixtieth of a second is about 16.7 milliseconds, which is not fine enough to catch all lines, but over many iterations of a program should represent the relative elapsed times of each line.

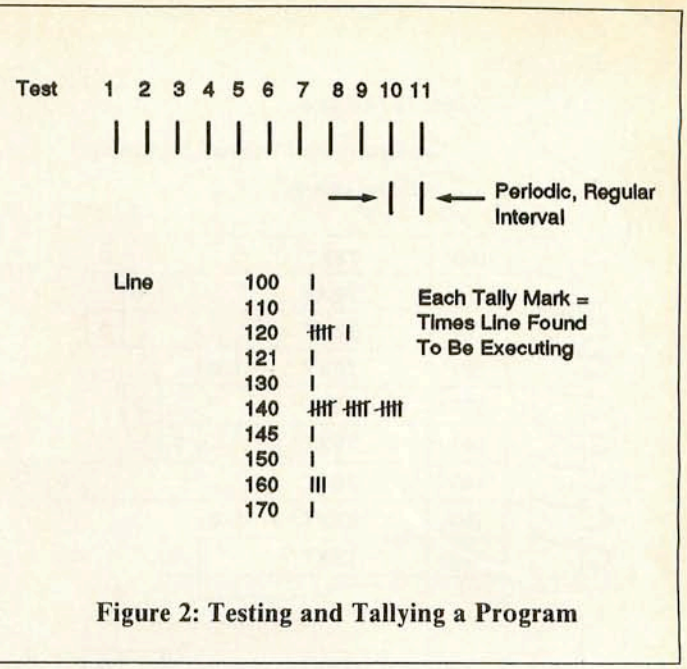


Figure 2: Testing and Tallying a Program

What's an (*Oops, There's the Doorbell!*) Interrupt?

An interrupt is a temporary suspense of the program's operation in order to perform some other important task. The important task is another program, but usually a short one. Once this task is performed, the interrupted task is picked up once again from the interruption point. Interrupts can be catastrophic or non-catastrophic.

Older computers with non-volatile core memory, which retained data even after power was turned off, had a "power fail" interrupt. In the space of a few milliseconds before the power disappeared completely, the status of the machine would be saved in core memory. When power was again restored, the program picked up again from the interrupted point. You could literally yank the power cord, wait a minute and plug it in again — the computer would continue typing a listing as if there had been no interruption!

A non-catastrophic interrupt is one that is more or less expected. Pressing a key on the keyboard generates an interrupt for some computers. If the computer is displaying data on the screen, the display might be interrupted for a few milliseconds while the keyboard character is read into a buffer. The user probably isn't even aware that the interrupt has occurred.

There are a number of different interrupts in the CoCo. The 60-Hertz (60 times per second) interrupt, though, is handled through the IRQ interrupt, which is usually the main interrupt in a microprocessor such as the 6809.

The IRQ interrupt is used mainly to increment a counter for the TIMER function. If you look up the TIMER function in the BASIC manual, you'll see that it returns a count of the elapsed time in one-sixtieth-second increments.

When an IRQ occurs, the 6809 microprocessor automatically transfers control to an interrupt subroutine in BASIC ROM. This interrupt subroutine contains a few dozen machine language instructions to increment the counter for the TIMER.

If we could sneak in a few lines of our own code, we could examine BASIC to see which line was executing, make a tally, and then let BASIC continue with the TIMER update function. Sounds easy enough. . . .

Which Line is Executing?

However, that's another problem. How do we know which line is being executed?

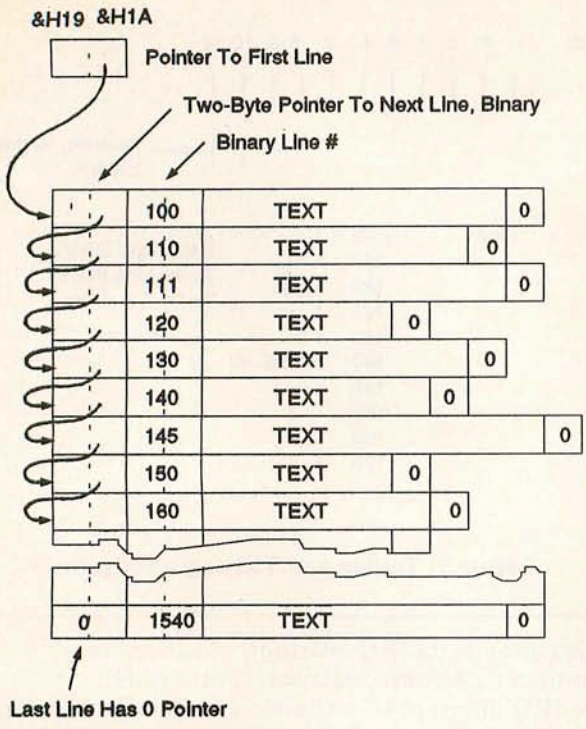


Figure 3: CoCo BASIC Program Line Format

Think about a BASIC interpreter. Obviously it has to record the current number of the line being executed, in addition to other things such as the current position of the BASIC statement in the line, the link to the next line, and so forth.

How do you go about finding out how BASIC operates? The best way is to get a disassembly of BASIC. CoCo BASIC is written in assembly language, a low-level language that the 6809 microprocessor understands. Microsoft, as secretive as the next billion-dollar company, doesn't freely distribute copies of the assembly language code for any system's BASIC. However, various people have disassembled the Microsoft code and published disassemblies with comments. By looking at these listings, you can see what is going on in BASIC. I've even been known to disassemble parts of BASIC myself, using the disassembly capability of *EDTASM+*, the CoCo editor/assembler/debugger. (However, I haven't published any disassemblies, so please don't ask me for one — I use the superlative Spectral Associates publications.)

In looking at the BASIC disassembly, it's easy to see that the start of the BASIC program is stored in locations &H19 and &H1A — the &H prefix indicates a hexadecimal constant. Addresses in the CoCo are stored in two bytes, with the first byte being the most significant and the second, the least. Together they make up a 16-bit number representing a memory address of 0 through 65535. (CoCo 3's extended memory still uses this scheme for the 64K memory space of BASIC.)

BASIC program lines have the rigid format shown in Figure 3. They are stored contiguously in memory, one following the other. They may be from six to 254 bytes long, depending upon what's in them. The first two bytes of each line, however, are the memory address, in binary, of the next BASIC program line. The next two bytes are the memory address, also in binary, of the line number. The text of the line follows, with the end of the line marked with a zero byte. BASIC text is "tokenized" — converted to one- or two-byte codes instead of ASCII characters — for efficiency in storage. The last line of the BASIC program has a zero value for the memory pointer.

The program shown in Listing 1 starts at the beginning of the BASIC program and follows the lines through to the end. The line number is displayed for each line, and the program stops when the last line is reached. As you can see, there's nothing too magical about this process. The two bytes of the memory pointer and line number are converted to a 16-bit unsigned integer (values from 0 through 65535) by multiplying the first byte by 256 and adding the second byte, as shown in Figure 4.

Recording the Lines

If we're to examine the program 60 times per second and tally which line is being executed, we'll need a table of line numbers and a place to put the count. Each 60 counts represents one second's worth of time. Since we might be waiting several seconds in some lines (for example, INPUT lines that are waiting on user input data), we'll need at least two bytes to hold a count value. One byte for a count value can hold only 255 counts, but two bytes can hold 65,535 counts, representing 1,092 seconds.

We want to hold these counts in memory, since writing to disk would be too slow. But where in memory? One option is to reserve an area of memory using the CLEAR statement. The CLEAR statement in the CoCo reserves a stack area (for BASIC's internal calls) and a protected memory area. The format of CLEAR is 100 CLEAR 800, &H6FAE.

Here every location from &H6FAF onward has been protected from use by BASIC — it's like setting aside a reserved area to do anything we want with. CoCo BASIC RAM memory extends from &H0000 (decimal 0) to &H7FFF (32,767 decimal). We also set aside 800 bytes above for the stack; this is just an arbitrary figure. In case you're wondering about the odd figure, &H6FAE, it'll be explained shortly.

&H7000 is a nice round figure at which to start a table. The table must hold every line number and a 16-bit count. Since line numbers are also 16 bits, we'll need four bytes for each entry, as shown in Figure 5. The area from &H7000 to &H7FFF is 4,096 bytes long, large enough to hold 4,096/4 = 1,024 entries. We'll actually hold 640 entries, however, due to

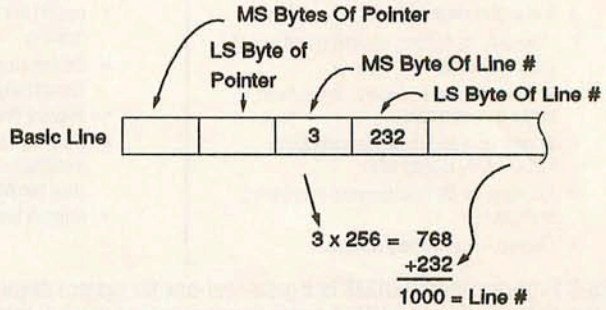


Figure 4: Conversion of Line Number and Pointer to 16-Bit Integer Values

display limitations. Still, 640 BASIC lines is a long program.

The program shown in Listing 2 scans the BASIC program in memory and lists all line numbers less than 10000. For each line number, an entry is made in the table at &H7000: two bytes of the line number and two bytes of the count, which is initialized to zero (there's garbage in the count if it is not cleared). The last line number of the table is marked as Line Number 0, a nonexistent line number.

The BASIC program to do this starts with Line Number 10000. We don't want to record the execution times of this program, but rather the execution time of another program to be tested; for this reason the *Time Analyzer* lines are ignored.

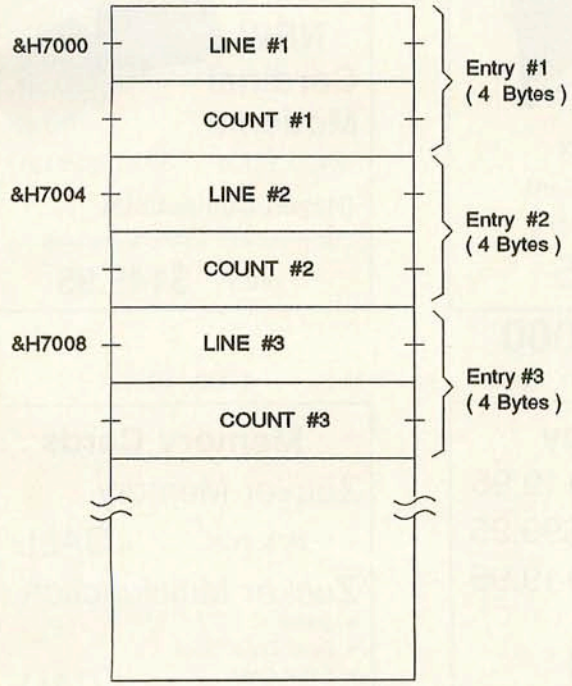


Figure 5: &H700 Table Format

The Program Display

Let's move ahead a little bit and see what kind of display we need. Assume that we have initialized the table, and the counts have been magically made during execution of the program we're testing. The next step is display the data in some coherent form. One way is shown in Figure 6.

Figure 6 uses the 640-by-192 mode of the CoCo 3 to display line numbers. Since there may be hundreds of them, they are displayed by position. Each dot position represents another line number; and the display goes from left to right, equivalent to BASIC program lines from beginning to end. The number of counts (one-sixtieth second) is displayed as a vertical line. The higher the line, the more times an interrupt occurred while that line was being executed and the more time that line takes.

However, we also want to be able to read out the actual count for each line. We've accomplished that by moving a "line cursor" along the X axis. As the line cursor is moved,

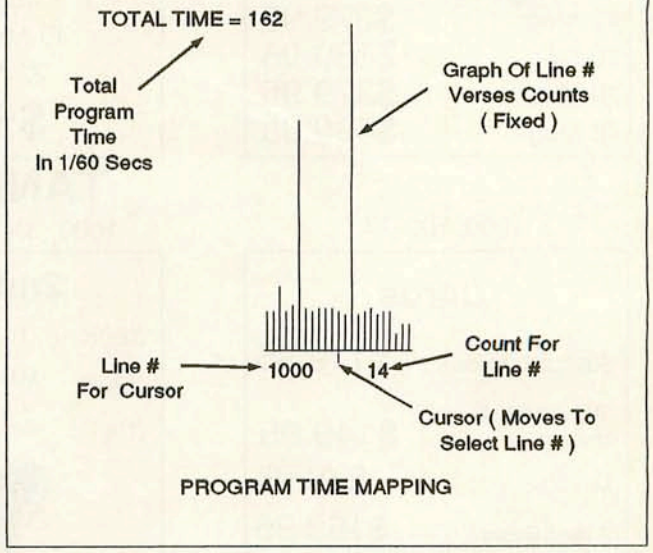


Figure 6: Displaying the Data

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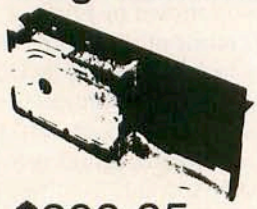

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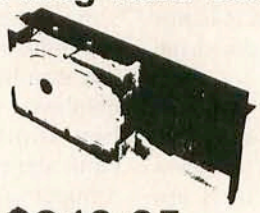

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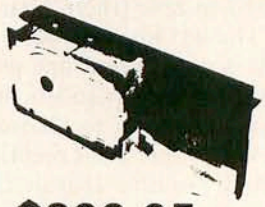

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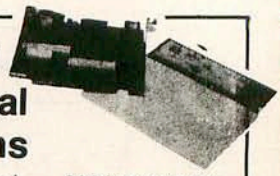

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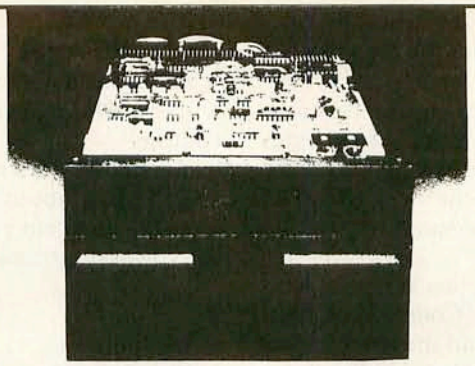

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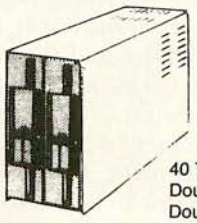

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the line number is displayed, along with the count for that line number. This gives us a way to read out the line number for interesting lines.

The program to display the table after execution is shown in Listing 3. It scans the &H7000 table by moving four bytes at a time. For each move the line number is read from the first two table bytes and the count from the next two. The count is used to draw a vertical line whose length represents the size of the count.

Cursor movement is handled by reading in a key press with an INKEY$ statement. If the right arrow (Code 9) has been pressed, the cursor is moved to the right and the line number and count displayed. If the left arrow (Code 8) has been pressed, the cursor is moved to the left and the line number and count displayed. All other key presses are ignored.

The (*Shudder*) Assembly Language Code

So far we have a BASIC program to initialize the table and to display the graph after program execution. The only thing missing is the program to increment the counts. Since the interrupts occur every 16.7 milliseconds, this program must be in assembly language, the only language fast enough to handle the interrupts.

Assembly language is tedious to learn and difficult in which to program. On the other hand, it's *fast*! Radio Shack currently puts its faith in the OS-9 assembler, discontinuing the excellent *EDTASM+* assembler that runs without OS-9. If you're not an OS-9 fanatic, I'd suggest getting a copy of *EDTASM+* — it's a great package on which to cut your assembly language teeth.

Every one-sixtieth of a second, an IRQ interrupt comes in. The assembly language code must get the current BASIC line number being executed, scan the table for that line number, and then bump by one the count for that line number entry. If a zero line number is encountered, the line number is assumed not to be in the table; the program doesn't do an increment. Line numbers equal to or greater than 10000 are also not incremented. After this action the assembly language code transfers control to the normal IRQ code.

The listing for this assembly language code is shown in Listing 4. The 6809 microprocessor has four registers that are used here. The Y register holds only a zero value, which is loaded in the first instruction. This value is used to test for the Line 0 and cause an exit.

The X register points to the next entry in the table. The table starts at &H7000, but the X register is initialized to &H6FFC, four bytes less. This is because the increment is made before the test.

The D register — the 16-bit equivalent of the eight-bit A and B registers joined together — hold the current line number. The current line number is picked up from one of those mysterious BASIC variables found in locations &H68 and &H69.

Each time through the LOOP, an LEAX +4,X instruction is executed. This adds four to the X register. The line number in D is then compared to the location pointed to by the X register. If the two values are not equal, the instruction at NFND tests the value in Y (0) against the location pointed to by X. If these are not equal, the end of the table has not been reached; the LOOP is reexecuted.

If the line number is found, the count at locations +2 and +3 from the location pointed to by the X register is bumped by one count. This must be done by loading the count into the D register (remember that the count is 16 bits), adding one to the D register (ADDD #1) and storing the D register back to the table.

After the increment of the count (or if the line is not found) a JMP $D8AF transfers control to the normal IRQ interrupt routine.

When 640 lines are in the program to be tested, the table search takes about 8 milliseconds, leaving half the time left over for program execution. This is a "worst-case scenario," as typical programs will be less than 640 lines.

Relocation

The assembly language program consists of 32 bytes of machine language code on the left (10BE . . . D8). This code is the executable form of the assembly language listing. It must be transferred to the protected memory area, starting at Location &H6FAF. The final program shown in Listing 5 does this by using pokes for each value. (Normally this would be done with DATA statements and a READ/POKE loop, but we don't want to have the program interfere with DATA statements in the program to be tested.) Each poked value corresponds to a machine language byte, transferred during the initialization portion of the program. Once in the protected memory area, they stay there until power is turned off.

Please Break This Chain!

The interrupt vector for the IRQ interrupt processing subroutine is found in the three bytes at &H10C. These three bytes are a machine language JMP instruction, with the last two bytes indicating the jump address.

The normal way to break an interrupt vector like this is to disable interrupts and put the new address into the second and third bytes of the JMP. Interrupts are disabled by the machine language TFR instruction that resets an interrupt bit in the Condition Codes register. Because this is tedious to do from BASIC, we made certain that the machine language program started at a location matching the second address byte of the normal interrupt processing subroutine.

The normal interrupt subroutine in the CoCo 3 starts at &HD8AF. By making our routine start at &H6FAF, only the first byte has to be changed. (Consider what would happen if this were not done: Assuming the new interrupt routine is at &H6FA0, the BASIC program changes the second byte of the JMP $D8AF to &H6F. Now an IRQ interrupt comes in. The microprocessor executes the JMP, which is now a JMP &H6FAF, 15 bytes into the new routine. Disaster ensues.) In most cases BASIC may be able to change both bytes without an IRQ interrupt coming in, but this approach is better programming practice.

The code in Listing 5 breaks the normal interrupt link by putting the new address of &H6FAF into Location &H10D. The last instruction of our new routine, don't forget, transfers control to Location &HD8AF, the original routine. We were able to sneak our processing in before the normal routine, which still works.

Using the Program

To use the program, merge the program to be tested with the code from Line 10000 onward. Also change or add a CLEAR statement to the program to be tested: 100 CLEAR 800, &H6FAE. At the end of the program to be tested, add a GOTO 10000.

After the two programs have been merged, RUN 10000.

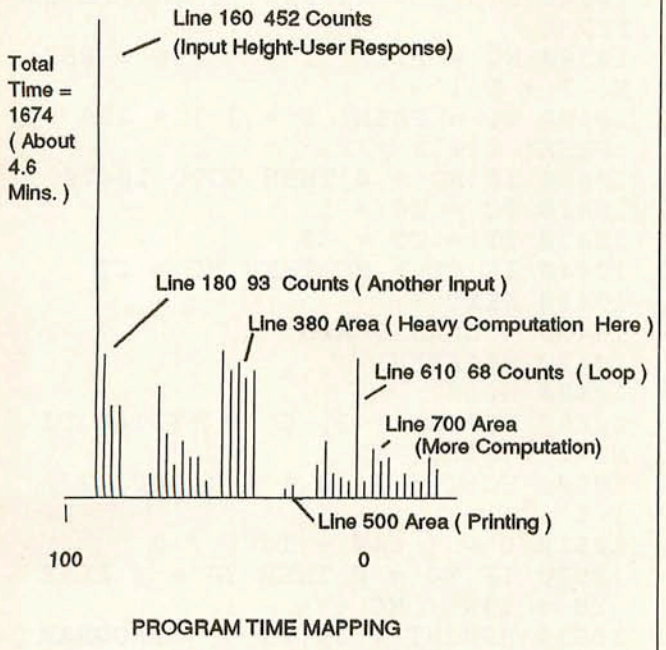


Figure 7: Typical Analysis Display

Choose I in response to the prompt "Initialize or Analyze (I or A)." The *Time Analyzer* program will scan all lines below 10000 and build a table in the `&H7000` area. Break the program after the next prompt, and run the program to be tested as usual.

If you have added a `GOTO 10000` at the end of the program to be tested, the program will automatically jump to the prompt message again. This time select A for Analyze. At this point all the counts during program execution have been accumulated. The Analyze function now displays the results. Move the cursor to investigate individual line counts. The total program time in one-sixtieth-second increments is displayed on the left of the screen.

When using the program for inputs, try to avoid long delays in entering data. The program scales the Y plot lines based upon the maximum counts, and `INPUT` statements with long user inputs diminish the plot of the other lines.

Summation

It's fascinating to see how long it takes to test different lines in the program. The display is perfect for finding critical timing problems. You can see which lines are taking the longest and take steps to correct the problem. Figure 7 shows a typical analysis display; this one is for the *Findmaze* program in my February 1988 RAINBOW column (Page 171). This is an 84-line program with a good mix of different types of statements. Note that user input and printing take a relatively long time compared to computation.

That's it! That wasn't so bad, was it? Did you survive? *Hey, are you listening? YOU OUT THERE. . . .* See you next month with more CoCo topics. □

Listing 1: PRNTLINE

```
10Ø ' PRINT LINE NUMBERS
11Ø TC = Ø
12Ø I = PEEK ( &H19 ) * 256 + PE
EK( &H1A )
13Ø L = PEEK( I ) * 256 + PEEK(
I + 1 )
14Ø NO = PEEK( I + 2 ) * 256 + P
EEK( I + 3 )
15Ø IF L = Ø THEN GOTO 2ØØ
16Ø PRINT NO,
17Ø I = L
18Ø TC = TC + 1
19Ø GOTO 13Ø
2ØØ PRINT: PRINT TC; "LINES"
21Ø END
```

Listing 2: LINETABL

```
1ØØ ' FIND LINE NUMBERS AND PUT
IN TABLE
11Ø CLEAR 8ØØ, &H6FAE
12Ø J = &H7ØØØ
13Ø I = PEEK ( &H19 ) * 256 + PE
EK( &H1A )
14Ø L = PEEK( I ) * 256 + PEEK(
I + 1 )
15Ø NO = PEEK( I + 2 ) * 256 + P
EEK( I + 3 )
16Ø IF ( L <> Ø ) AND ( NO < 1ØØ
ØØ ) THEN GOTO 2ØØ
17Ø POKE J, Ø: POKE J + 1, Ø
18Ø PRINT: PRINT ( J - &H7ØØØ )
/ 4; "LINES"
19Ø END
2ØØ PRINT NO,
21Ø POKE J, PEEK( I + 2 ): POKE
J + 1, PEEK( I + 3 )
22Ø POKE J + 2, Ø: POKE J + 3, Ø
23Ø J = J + 4: IF J > &H7ØØØ + 2
56Ø THEN PRINT "PROGRAM > 64Ø LI
NES": STOP
24Ø I = L
25Ø GOTO 14Ø
```

Listing 3: ANALYZE

```
1Ø34Ø ' ANALYZE PORTION
1Ø35Ø HBUFF 1, 4ØØ
1Ø36Ø TC = Ø: MC = Ø: TT = Ø
1Ø37Ø ' COUNT LINES AND FIND MAX
 VALUE IN TABLE
1Ø38Ø FOR I = &H7ØØØ TO &H7FFE S
TEP 4
1Ø39Ø NO = PEEK( I ) * 256 + PEE
K( I + 1 )
1Ø4ØØ CT = PEEK( I + 2 ) * 256 +
 PEEK( I + 3 )
1Ø41Ø IF NO = Ø THEN GOTO 1Ø47Ø
1Ø42Ø TC = TC + 1
1Ø43Ø TT = TT + CT
1Ø44Ø IF CT > MC THEN MC = CT
1Ø45Ø NEXT I
1Ø46Ø ' DRAW GRAPH
1Ø47Ø HSCREEN 4
1Ø48Ø HCLS
1Ø49Ø HPRINT ( 2, 5 ), "TOTAL TI
ME=" + STR$( TT )
1Ø5ØØ HGET ( Ø, Ø ) - ( 16Ø, 7 )
, 1
1Ø51Ø D = ( 64Ø - TC ) / 2
1Ø52Ø IF MC = Ø THEN YS = Ø ELSE
 YS = 15Ø / MC
1Ø53Ø HPRINT ( 3Ø,23 ), "PROGRAM
 TIME MAPPING"
1Ø54Ø FOR I = 1 TO TC
1Ø55Ø Y = PEEK( &H7ØØ2 + ( I - 1
 ) * 4 ) * 256 + PEEK( &H7ØØ3 +
( I - 1 ) * 4 )
1Ø56Ø HLINE ( D + I, 16Ø ) - ( D
 + I, 16Ø - INT( Y * YS ) ), PSE
T
1Ø57Ø NEXT I
1Ø58Ø ' MOVE CURSOR AND PRINT LI
NE AND COUNT
1Ø59Ø X = D + 1: Y = 162: I = 1:
 C = Ø
1Ø6ØØ HLINE (X, 162 ) - ( X, 17Ø
 ), PSET
1Ø61Ø HPUT ( 272, 176 ) - ( 432,
 183 ), 1, PSET
1Ø62Ø HPRINT (34,22),PEEK(&H7ØØØ
+(I-1)*4)*256 + PEEK(&H7ØØ1+(I-1
)*4)
1Ø63Ø HPRINT (42,22),PEEK(&H7ØØ2
+(I-1)*4)*256 + PEEK(&H7ØØ3+(I-1
)*4)
1Ø64Ø A$ = INKEY$: IF A$ = "" TH
EN GOTO 1Ø64Ø
1Ø65Ø IF A$ = CHR$( 8 ) THEN X =
 X - 1: I = I - 1: IF I < 1 THEN
 X = X + 1: I =       I + 1 ELSE
 HLINE( X + 1, 162 ) - ( X + 1,
17Ø ), PRESET
1Ø66Ø IF A$ = CHR$( 9 ) THEN X =
 X + 1: I = I + 1: IF I > TC THE
N X = X - 1:          I = I - 1
ELSE HLINE( X - 1, 162 ) - ( X -
 1, 17Ø ), PRESET
1Ø67Ø GOTO 1Ø6ØØ
```

Listing 4:

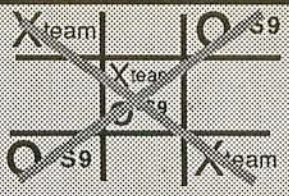
```
6FAF                ØØ1ØØ          ORG     $6FAF
6FAF 1Ø8E ØØØØ      ØØ11Ø START    LDY     #Ø      TERMINATOR
6FB3 8E   6FFC      ØØ12Ø          LDX     #$6FFC  START OF TABLE-4
6FB6 DC   68        ØØ13Ø          LDD     $68     GET CURRENT LINE #
6FB8 3Ø   Ø4        ØØ14Ø LOOP     LEAX    +4,X      BUMP TO NEXT ENTRY
6FBA 1ØA3 84        ØØ15Ø          CMPD    ,X        COMPARE LINE #S
6FBD 26   Ø9        ØØ16Ø          BNE     NFND      GO IF NOT EQUAL
6FBF EC   Ø2        ØØ17Ø          LDD     +2,X      BUMP COUNT
6FC1 C3   ØØØ1      ØØ18Ø          ADDD    #1
6FC4 ED   Ø2        ØØ19Ø          STD     +2,X
6FC6 2Ø   Ø5        ØØ2ØØ          BRA     OUT       ON TO REST OF INT
6FC8 1ØAC 84        ØØ21Ø NFND     CMPY    ,X        END?
6FCB 26   EB        ØØ22Ø          BNE     LOOP      GO IF NO
6FCD 7E   D8AF      ØØ23Ø OUT      JMP     $D8AF   OUT TO INT PROCESSING
          6FDØ      ØØ24Ø LAST     EQU     *
          ØØØØ      ØØ25Ø          END
```

Listing 5: TIMEFIND

```
1ØØØØ ' PROGRAM TIME ANALYZER
1ØØ1Ø CLS
1ØØ2Ø PRINT "PROGRAM TIME ANALYZ
ER"
1ØØ3Ø INPUT "INITIALIZE OR ANALY
ZE (I OR A)"; RE$
1ØØ4Ø IF RE$ = "A" THEN GOTO 1Ø3
5Ø
```

```
1Ø05Ø ' INITIALIZE PORTION
1Ø06Ø CLEAR 8ØØ,&H6FAE
1Ø07Ø ' MOVE ML CODE
1Ø08Ø POKE &H6FAF,&H1Ø:POKE &H6F
BØ,&H8E:POKE &H6FB1,&HØØ:POKE &H
6FB2,&HØØ
1Ø09Ø POKE &H6FB3,&H8E:POKE &H6F
B4,&H6F:POKE &H6FB5,&HFC:POKE &H
6FB6,&HDC
1Ø1ØØ POKE &H6FB7,&H68:POKE &H6F
B8,&H3Ø:POKE &H6FB9,&HØ4:POKE &H
6FBA,&H1Ø
1Ø11Ø POKE &H6FBB,&HA3:POKE &H6F
BC,&H84:POKE &H6FBD,&H26:POKE &H
6FBE,&HØ9
1Ø12Ø POKE &H6FBF,&HEC:POKE &H6F
CØ,&HØ2:POKE &H6FC1,&HC3:POKE &H
6FC2,&HØØ
1Ø13Ø POKE &H6FC3,&HØ1:POKE &H6F
C4,&HED:POKE &H6FC5,&HØ2:POKE &H
6FC6,&H2Ø
1Ø14Ø POKE &H6FC7,&HØ5:POKE &H6F
C8,&H1Ø:POKE &H6FC9,&HAC:POKE &H
6FCA,&H84
1Ø15Ø POKE &H6FCB,&H26:POKE &H6F
CC,&HEB:POKE &H6FCD,&H7E:POKE &H
6FCE,&HD8
1Ø16Ø POKE &H6FCF,&HAF
1Ø17Ø ' CHANGE THE LS BYTE OF NM
I INTERRUPT VECTOR
1Ø18Ø POKE &H1ØD, &H6F
1Ø19Ø ' FIND LINES NUMBERS AND P
UT IN TABLE
1Ø2ØØ J = &H7ØØØ
1Ø21Ø I = PEEK ( &H19 ) * 256 +
PEEK( &H1A )
1Ø22Ø L = PEEK( I ) * 256 + PEEK
( I + 1 )
1Ø23Ø NO = PEEK( I + 2 ) * 256 +
 PEEK( I + 3 )
1Ø24Ø IF ( L <> Ø ) AND ( NO < 1
ØØØØ ) THEN GOTO 1Ø28Ø
1Ø25Ø POKE J, Ø: POKE J + 1, Ø
1Ø26Ø PRINT: PRINT ( J - &H7ØØØ
) / 4; "LINES"
1Ø27Ø GOTO 1ØØ3Ø
1Ø28Ø PRINT NO,
1Ø29Ø POKE J, PEEK( I + 2 ): POK
E J + 1, PEEK( I + 3 )
1Ø3ØØ POKE J + 2, Ø: POKE J + 3,
 Ø
1Ø31Ø J = J + 4: IF J > &H7ØØØ +
 256Ø THEN PRINT "PROGRAM > 64Ø
LINES": STOP
1Ø32Ø I = L
1Ø33Ø GOTO 1Ø22Ø
1Ø34Ø ' ANALYZE PORTION
1Ø35Ø HBUFF 1, 4ØØ
1Ø36Ø TC = Ø: MC = Ø: TT = Ø
1Ø37Ø ' COUNT LINES AND FIND MAX
 VALUE IN TABLE
1Ø38Ø FOR I = &H7ØØØ TO &H7FFE S
TEP 4
1Ø39Ø NO = PEEK( I ) * 256 + PEE
K( I + 1 )
1Ø4ØØ CT = PEEK( I + 2 ) * 256 +
 PEEK( I + 3 )
1Ø41Ø IF NO = Ø THEN GOTO 1Ø47Ø
1Ø42Ø TC = TC + 1
1Ø43Ø TT = TT + CT
1Ø44Ø IF CT > MC THEN MC = CT
1Ø45Ø NEXT I
1Ø46Ø ' DRAW GRAPH
1Ø47Ø HSCREEN 4
1Ø48Ø HCLS
1Ø49Ø HPRINT ( 2, 5 ), "TOTAL TI
ME=" + STR$( TT )
1Ø5ØØ HGET ( Ø, Ø ) - ( 16Ø, 7 )
, 1
1Ø51Ø D = ( 64Ø - TC ) / 2
1Ø52Ø IF MC = Ø THEN YS = Ø ELSE
 YS = 15Ø / MC
1Ø53Ø HPRINT ( 3Ø,23 ), "PROGRAM
 TIME MAPPING"
1Ø54Ø FOR I = 1 TO TC
1Ø55Ø Y = PEEK( &H7ØØ2 + ( I - 1
 ) * 4 ) * 256 + PEEK( &H7ØØ3 +
( I - 1 ) * 4 )
1Ø56Ø HLINE ( D + I, 16Ø ) - ( D
 + I, 16Ø - INT( Y * YS ) ), PSE
T
1Ø57Ø NEXT I
1Ø58Ø ' MOVE CURSOR AND PRINT LI
NE AND COUNT
1Ø59Ø X = D + 1: Y = 162: I = 1:
 C = Ø
1Ø6ØØ HLINE (X, 162 ) - ( X, 17Ø
 ), PSET
1Ø61Ø HPUT ( 272, 176 ) - ( 432,
 183 ), 1, PSET
1Ø62Ø HPRINT (34,22),PEEK(&H7ØØØ
+(I-1)*4)*256 + PEEK(&H7ØØ1+(I-1
)*4)
1Ø63Ø HPRINT (42,22),PEEK(&H7ØØ2
+(I-1)*4)*256 + PEEK(&H7ØØ3+(I-1
)*4)
1Ø64Ø A$ = INKEY$: IF A$ = "" TH
EN GOTO 1Ø64Ø
1Ø65Ø IF A$ = CHR$( 8 ) THEN X =
 X - 1: I = I - 1: IF I < 1 THEN
 X = X + 1: I =       I + 1 ELSE
 HLINE( X + 1, 162 ) - ( X + 1,
17Ø ), PRESET
1Ø66Ø IF A$ = CHR$( 9 ) THEN X =
 X + 1: I = I + 1: IF I > TC THE
N X = X - 1:          I = I - 1
ELSE HLINE( X - 1, 162 ) - ( X -
 1, 17Ø ), PRESET
1Ø67Ø GOTO 1Ø6ØØ
```

XTEAM & OS-9



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Volunteers Build a Better Mousetrap

By Dale L. Puckett
Rainbow Contributing Editor

The OS-9 wizards stole the show at our RAINBOWfest Chicago seminar. Two products demonstrated by Kevin Darling, Mark Griffith, Ron Lammardo and Kent Meyers redefined ease of use for Color Computer OS-9. Several others were spectacular and brought oohs and ahhs from the crowd. Most importantly, however, these OS-9 Users Group members have released their work into the public domain and were distributing it to Users Group members at RAINBOWfest Chicago.

We were also fortunate enough to interview a rising young star in the Color Computer OS-9 community. We'll share Chris Burke's views with you this month and then move on to get you started with a few lines of code that may soon become *Gfx3*.

During our seminar, Darling and Lammardo put the new Kent Meyers *GShell* through its paces. The new addition to the OS-9 Users Group Software Library contains six files as well as the `ar` and `ipatch` utilities you need to install them. They include:

`GShell.ipc`	an Ipatch file
`CC3io.ipc`	an Ipatch file
`Scf.ipc`	an Ipatch file
`Gsort`	a new command for the file
`MenuCopy`	a replacement for Tandy's `copy` command
`Free`	a replacement for Tandy's `free` command

You must purchase OS-9 Level II and *Multi-Vue* from Tandy to get the original `GShell`, `CC3io` and `Scf` files you'll be patching. These programs have been copyrighted by Microware and Tandy, and you may not distribute them. The `ipatch` files are in the public domain, however, and may be passed around freely as long as no files from OS-9 Level II or *Multi-Vue* are included. The three new utility commands are all in the public domain.

Here are some of the new features the crowd saw at our OS-9 seminar. Typing `S` when the *GShell* window is active pops up an overlay window and starts a standard OS-9 Shell. You can then run OS-9 from the command line to your heart's content. Return to *GShell* by holding down the CTRL key and striking the BREAK key.

If you select any file or directory on the *GShell* screen by pointing to it and clicking once, you can delete it by moving the mouse pointer to the trash can icon and clicking again. The new *GShell* deletes the file immediately without asking you if you are sure. It uses the OS-9 `Del` utility to delete a file and the `Deldir` utility to delete a directory.

If you double click on any text file icon, *GShell* assumes it is a valid OS-9 procedure file and attempts to execute it as a shell script. If you try to execute a file that does not contain a shell script, OS-9 will print an error message.

If you double click on any program icon, *GShell* will run the program for you after asking for any parameters. *GShell* knows a file is a program when it finds the `execute attributes` set. Additionally, you may now list and print an `AIF` file by selecting it and using the appropriate command in the Files menu.

You'll find a new command in the Files menu now. `Sort` causes all files in the directory displayed to be sorted in ASCII order. This means your `AIF` files always move to the beginning of a directory and appear in the first screen.

You'll notice another convenience when you need to answer the infamous "Are you sure?" prompt. The "sure" box is now displayed on the screen very close to the last position of the mouse pointer. Before, it was always displayed near the center. This Kent Meyers addition will help you keep your mouse movements to a minimum.

Dale L. Puckett, a freelance writer and programmer, serves as director-at-large of the OS-9 Users Group and is a member of the Computer Press Association. His username on Delphi is DALEP: on packet-radio, K0HYD @ N4QQ; on GEnie, D.PUCKETT2; and on CIS, 71446,736.

If all of these new features aren't enough, hang on to your hat — there's more! Directory names longer than the directory bar now scroll to the left. Graphics Put buffers in use are now killed on entry and exit. A black border has been added to all *GShell* and Tandy menu shells. You may also select a 16-color 40-by-24 window from the View menu.

Since Meyers is a stickler for detail, all *GShell* prompts now start with capital letters. This makes them look more professional. Adding a question mark in the second line of an AIF file now causes *GShell* to prompt you for parameters before executing the program. And if you find a prompt on your screen and don't have an answer, clicking the mouse will cause the prompt to go away and the function you were running to be aborted.

When you do have something to say, you'll have more room. Meyers has expanded the size of the "Parameters for" box by 10 spaces. If you click on a file icon that has an AIF file associated with it, the program name, parameters and finally the filename are sent to the shell.

Clicking first on any program file icon and then clicking on the question mark in the upper right corner of the menu bar, or selecting the Help command from the Tandy menu, gives you help for that program — if it's available in the help file in your system directory.

Additionally, programs that run in *GShell*'s overlay window now run with the mouse and the graphics pointer turned off. This makes them much faster. When a display scrolling in the *GShell* overlay window pauses, it can be restarted by clicking the mouse. To use this option you must patch the CC3io and Scf modules with the files on the disk. The bug that once caused your window to disappear when you quit GShell after starting it with Multi-start or AutoEx has been fixed.

While he was adding these new features, Meyers optimized *GShell+* and removed all the bugs he could find. *GShell+* is far more reliable than the original version and much faster. The CC3io and Scf patch files on the disk give you the following features and fixes:

CoCo 3 defaults to montype RGB when you boot OS-9.

A palette register problem has been fixed.

Condemned processes are killed automatically.

The mouse button can be used to un-pause a screen.

The un-pause feature also works outside of *GShell* in any OS-9 window or SCF-type device.

Following the *GShell* demonstration Ron Lammardo answered questions about the new *Shell+* he masterminded and helped develop. The Users Group distributed Version 1.3a on the GShell disk at RAINBOWfest.

After Lammardo spoke, Kevin Darling stole the show by playing an audio cut from *Star Trek*. He then held the microphone to the CoCo 3 speaker while he played an additional dozen sounds, including the infamous blurb that describes more than one writer on deadline: "I'm trying to think, but nothing happens!"

Darling also awed the crowd with a few animated high-resolution graphics screens. In one, a waterfall lulls you with its serenity. In another, a jet flies over the earth's surface at varying speeds. The player program doing the work was named *Vefio*. Darling played back the images by double clicking on *Multi-Vue* icons.

Mark Griffith wrote the new Copy command distributed by the Users Group at Chicago. It is a direct replacement for the standard copy utility. However, it works only with *Multi-Vue*. Run Griffith's Copy by selecting a file and then choosing Copy on the Files menu. The first thing you'll see is a pop-up overlay window. If you are copying a file to the same directory, you need only type a filename. If you want to make a copy in another directory or on another disk, you type just the device name and directory. You no longer need to retype the filename you selected earlier with the mouse. If the new name you type already exists, an overlay window will pop up, and you'll be asked if you want to overwrite the existing file.

While the OS-9 wizards were wowing the seminar crowd, Tony DiStefano was doing the same with his new Super Controller II at the CRC booth. This board does not halt the 6809 processor while it is reading from or writing to the disk. This returns OS-9's type-ahead feature to the Color Computer.

Kevin Darling wrote the OS-9 drivers for CRC. We picked up a final production copy of Darling's drivers at Chicago and while reading the manual on the flight back to Washington, came across a discussion of the infamous "OS-9 Boot file order problem." Here's a common problem: Your new disk won't boot under Level II. Before you blame your new controller or your Color Computer, answer the following questions:

Have you remembered to include a CMDS directory on your boot disk?

Does it contain a Shell file and Grfdrv?

Are the execution permissions set: attr /d0/cmds/shell e pe?

This is a pretty common problem, even among the oldtimers. If you answered the questions above correctly, you may have stumbled into the infamous "boot order" failure. Here are the symptoms: Your disk fails to boot at all, or — more often — when you format a disk you wind up with many Read Errors.

All the major Level II third-party software and hardware makers are aware of this problem, but so far, no one has come up with a satisfactory explanation. It happens most often when you add a new module to your boot list or Config list. Theoretically, since all OS-9 code is position-independent, it shouldn't matter where a driver module ends up. There are many theories about what causes this failure, but the only known "fix" is to rearrange the order of the modules in your OS-9 Boot file.

CRC distributes one of Darling's programs, *DirM*, to help you determine a possible boot order if you run into trouble. *DirM* is similar to *Mdir*, except it reports the actual RAM block numbers that hold your modules. The prevailing theory is that RBF, CC3Disk, DD, D0, D1, as well as other RBF drivers and descriptors, should all end up with the same block number when you boot up.

If you have a problem but can boot up, run *DirM*. Note the first number on the lines for those modules. If they differ, you may have found the trouble. Try another Os9gen boot list order by using your editor to move a module name or two in your boot list file — either from before the RBF modules to after them or vice versa. Remember, your goal is to make those RBF-type modules wind up in the same 8K block of memory.

A common first try is to simply move the Init module to the end of the list. This has worked for many people. Because no one actually knows what causes this problem, Darling recommends that you do not make backups of important disks until you've tried out the drivers for a couple of days. How-

```
RSDos -cmd [-mod] device-name [DOS-path] [OS9-path] Switches

-dir    for a directory listing of an RS-DOS disk
-get    to import a file from an RS-DOS disk
-del    to delete a file from an RS-DOS disk
-put    to export a file to an RS-DOS disk

Modifiers

-b      for type 0: BASIC binary type program
-d      for type 1: BASIC data file
-m      for type 2: executable machine language program
-t      for type 3: text editor source file
-a      for ASCII format (default is binary)
-f=n    sets the file type to n (n = 0-255)
```

Figure 1

ever, if you can format new disks with no difficulty and can copy large files such as OS9boot to another disk without errors, you are most likely in good shape.

When you buy the Super Controller II, you get several extra utilities. RSDOS from Ipatch author Bob Santy is one that is sure to please. This import/export utility displays directories, transfers files to and from a Color Computer RS-DOS diskette and deletes files from RS-DOS diskettes.

The syntax and a list of switches and modifiers accepted by RSDos.os9 are shown in Figure 1.

Tony DiStefano plans to add a combination clock, parallel port and serial port card to the Disto lineup soon. This card can be installed inside the SC-II and means you may no longer need to use the Multi-Pak Interface. Rumor control has it that another board with four devices will be available from CRC in the not-too-distant future.

FD 502 Double-Sided 40-track Secondary Drive Fix

See pg 163

When I read Kevin Darling's description of the boot list order problem in the Disto Super Controller II driver documentation, it reminded me of another problem he mentioned. The Color Computer normally turns on both drive motors, even though it selects only one drive for access at a time. This ensures that when you are running a copy utility to move files between drives, you need not wait for a drive to spin up to 300 rpm each time your program switches from Drive 0 to Drive 1. Because of this convention, all disk drivers for the Color Computer assume that all drives are ready to use if the motor line is on. In the past this has been true.

Now for the "gotcha!" The second disk drive used in the two-drive FD 502 cases has a jumper inadvertently misplaced. These drives ignore the motor line and spin only when selected. This means that every time you see your Drive 1 light go on, it takes a fraction of a second for it to get up to speed. When the light goes out, the drive stops. This makes disk operations unreliable.

You may not have a problem while running RS-DOS programs because they normally run at 1 MHz. If you are using OS-9 with the vanilla Level II CC3Disk module, you may have occasional problems — especially when copying from /D0 to /D1. If you are using the new Disto Super Controller II with the no-halt drivers, you must fix the jumper.

To see if your drive acts this way, loosen the four outside screws that hold the case together. Observe the top of Drive 1 while trying POKE &HFF40,2. If the motor and light come on, you need to change the jumper. To do this, remove the top drive. Remove the two screws holding the fan and lay it back out of the way. Now, pull off the black/yellow/red power cable and the main 34-wire control cable. Slide the drive out, being careful to hold it up so it doesn't fall on the bottom drive. Remove the two flat plastic head/sensor cables that connect to the circuit board by lifting up on the top of the plastic block they plug into. This releases the tension lock on the cables so that they will pull out easily.

Also, remove the four-pin cable that leads forward to the index-hole and write-protect sensors. Flip the drive over and remove the three screws that hold the circuit board. Remove the two cables attached to the motors. Look at the top of the circuit board, and note where the cable to the controller plugs in. You should see two small bare-wire jumpers soldered to the board; ignore the one near Pin 34. On the side nearest Pin 2 of the 34-pin edge card, in one of two sets of holes marked '5' you'll find another. Remove or clip it, then run a wire between the other marked set of holes. Be careful when you solder in the new jumper.

Put everything back together and type POKE &HFF40,2. The light should come on, but the motor will not be running. Now type POKE &HFF40,8. The motor should come on but the light should stay out. Try POKE &HFF40,10. The motor and light should both come on. Finally, type POKE &HFF40,0. Both the motor and light should go off — you passed the test!

Chris Burke — A Rising OS-9 Star

Chris Burke and his wife, Trisha, sell OS-9 and RS-DOS hard disks and OS-9 utilities. They live in Schaumburg, Ill., only two miles from the site of RAINBOWfest Chicago. Their Color Computer adventure began in 1982 when they bought a Color Computer with Level I OS-9 for $500. They bought it because it was the least expensive graphics-based computer available at the time and because the 6809 is a good processor. "I couldn't find a better value anywhere," Burke said.

Burke started out writing programs in Extended Color BASIC, but he soon added OS-9 and discovered that he really liked it. "OS-9 was like UNIX, and I was familiar with UNIX. OS-9 made a lot of sense because of its modular structure.

"Before long, I set up some quad density drives and got involved with the local OS-9 Users Group. I made a presentation one evening to show them how to put these big drives on the CoCo. A lot of people went out and did it. I wrote a lot of 'fun' OS-9 stuff — device drivers, etc. — and added a lot of hardware. I even built something like the Super Board. But I still wasn't in business," Burke said.

Burke thought the quad density drives were nice but decided he needed something more. "I saw a few hard drives advertised in RAINBOW for about $900," he said. "Unfortunately, that was out of the question — I didn't have that kind of money. Luckily, I noticed a few drives advertised in *Byte* magazine for $450 a few months later. I knew a little bit about the drives, so I went to work and got OS-9 Level I running on a hard

drive. Then I got OS-9 Level II and wrote another driver.

"This was about two years ago and we still weren't in business, but about that time, Trisha and I noticed one of Marty Goodman's columns in RAINBOW. He was telling why Color Computer hard drives were so expensive, while IBM hard drives were cheap. We were already using an IBM drive on our Color Computer, so the 'light' went on and we decided to go in business. Our only product was an OS-9 hard disk interface called the CoCo-XT."

Burke still doesn't sell the drives — just the interface and the software. He hasn't jumped into this arena because he believes everyone knows you can still get a better deal on an IBM drive through one of the large discount houses. Later Burke added a real-time clock with battery backup to his XT and called it the XT-RTC.

He showed both interfaces at local computer clubs and RAINBOWfest Princeton. "That was our first public offering, and our products were well-received. A few people were hesitant because they had never heard of us before; when they saw our $450 price, they thought we were setting them up. Then people started calling and asking if they could sell for us — Sugar Software, Howard Medical, FHL all wanted to sell Burke's hard disk interface.

"Before we came along, hard disks had been a closed market. For a long time there was only Owl-Ware. Then Disto added a hard disk interface to its line. Ours was something dealers could sell, so we put it in distribution immediately."

After this initial success, Chris and Trisha started expanding their product line. They added *Hyper-IO*, a program that lets you use a hard drive under BASIC. It is OS-9 compatible and stores an entire floppy image as one OS-9 file. You can delete or add a whole floppy at the same time. This means you can run OS-9 and RS-DOS programs from the same hard drive, although not concurrently. *Hyper-IO* gives RS-DOS users the advantage of making their floppy images any size.

The floppy on your hard disk can look like a double-sided 80-track, a 3-megabyte drive, or whatever. Another nice thing about *Hyper-IO* is the fact that it gives you the ability to add utilities to transfer files from OS-9 to RS-DOS — on a hard drive or a floppy. Burke also gives you a patch that lets the OS-9 assembler create RS-DOS programs. After you assemble them, you can copy them to an RS-DOS directory.

Yet, for Burke, *Hyper-IO* was only a beginning. Before long, he found himself designing *RSB*, which stands for *Radio Shack BASIC*. "People say they don't like OS-9 because it's hard to use and hard to learn," Burke said. "I don't believe it is hard to use. I believe it's different from what they have learned. What they mean when they say OS-9 is hard to use is that when they type `run game` it doesn't work."

RSB uses the same command syntax as *Hyper-IO*, but it runs in an OS-9 shell. All of the *Radio Shack Basic* graphics commands have been modified to use OS-9 Level II system calls. "When you run *RSB* the first time, we take the BASIC code in ROM and move it to your hard disk," Burke said. "Then we patch the I/O drivers to make system calls and patch the code to make it relocatable. Since we only had to change about 10 percent of code, *RSB* was a reasonable project."

Burke's goal is to make OS-9 appear friendly to people who use RS-DOS regularly. He believes that once they start using *RSB*, they will become familiar with OS-9's features — the spoolers, hard drives, additional serial ports, etc. — because *RSB* uses OS-9 drivers. "At the same time they are running *RSB*, they will be able to flip over to another window and use an OS-9 application program. In fact, because of OS-9 *RSB* users will even be able to run several different RS-DOS programs in different windows at the same time. All of this will be going on concurrently!" Burke said.

Burke is presently working on *MUSE*, an `Scf` driver for music that will play a string from *RSB*. Since he is writing it as a device driver and device descriptor named `/MU`, you will be able to use it with your Radio Shack Sound Pack or the Super Voice cartridge from Speech Systems. In fact, you will have a no-halt music device in a sense, because the two boards take a string and play it. The Level II internals will generate the sounds.

Another OS-9 utility marketed by Burke & Burke is `EZGen`, a boot file editor similar to the Sugar Software `Patcher` utility. With it, when you get an upgrade of a device driver, you need only type `EZGen /d0 /os9boot`, link to `Cc3disk` and then type `u`, followed by a path list to the new driver. `EZGen` will pull out the old driver and put the new one in your boot file, making sure your boot file stays contiguous.

Burke & Burke also markets a utili-

ties disk that features `Wild` and `Mv`. `Wild` has a recursive option and can handle commands like `wild -kp asm *.src o*` or `wild del c.temp*`. `Mv` will move a directory entry from one point on the tree to another. When it runs, it moves the directory entry to a different directory, leaving the files in the same directory.

All Burke & Burke utilities are written in C, while all device drivers are written in assembly. Why does Chris Burke use OS-9? "Because like UNIX it's modular," he said. "When you add something, you don't need to learn a whole bunch of stuff over again. When you add a hard drive, it acts just like a floppy drive. Besides, it does multitasking and uses windows.

"The OS-9 windows are far better than MS-DOS windows because they are true multitasking windows," Burke said. "*MS Windows* is merely a 'kluge' on top of MS-DOS. Besides, if you time the Color Computer 3 running OS-9 Level II against an IBM XT, you'll find the CoCo is faster in most applications."

What does Burke see in the future for OS-9? "I think we need to get a lot of people writing OS-9 software. We need to get some good programs that will attract users. Once more users are attracted, more people will want to write programs. I think OS-9 has a really good future because it's a really good operating system. The 68K version is the standard for compact disk interaction, and someday there will be software running on OS-9 that is just as good as any running on MS-DOS."

Our Listing

This month we give you the framework of *Gfx3*. Feel free to tailor it to meet your desires. Once you type this subroutine package in and pack it, you can merge it with *Gfx2* and tap the functionality built into OS-9's `WindInt` manager interactively from within your BASIC09 programs — just like you use the graphics primitives with *Gfx2* now.

The day I started this month's column, I received an E-mail letter with *WizPro* attached from author Bill Brady. You won't believe your eyes. *WizPro* is not only the first 128K program for the Color Computer 3 — it's the first extendable communications program for the CoCo 3. Digest that thought for a while, and I'll be back to tell you more about this fantastic product next month. Until then, keep on hacking! □

The listing: `Gfx3`

```
PROCEDURE gfx3
0000      (* Add Basic09 functions to use WindInt functionality
0035      (* Syntax: run gfx3([path,]"Action",params)
0060
0061      PARAM path:BYTE
0068      PARAM action:STRING[12]
0074      PARAM one,two,three,four:INTEGER
0087
0088      TYPE Registers=cc,a,b,dp:BYTE; x,y,u:INTEGER
00AD      DIM Regs:Registers
00B6
00B7      DIM F_Icpt,F_Sleep:BYTE
00C2      DIM I_Getstt,SS_MnSel:BYTE
00CD      DIM I_SetStt,SS_MsSig,StdIn,SS_GIP,SS_Mouse:BYTE
00E4      DIM ss_sbar,ss_wnset,ss_umbar,gs_mouse:BYTE
00F7      DIM gs_opt,ss_ssig,ss_rel,ss_scsiz,gs_palt:BYTE
010E      DIM gs_kysns,ss_styp,ss_fbrg,ss_mtyp:BYTE
0121      DIM MouseSig,Follow:INTEGER
012C      DIM Grp_Ptr,Ptr_Arr:BYTE
0137
0138      Grp_Ptr:=202
013F      Ptr_Arr:=1
0146      F_Icpt:=$09
014E      F_Sleep:=$0A
0156      I_Getstt:=$8D
015E      I_SetStt:=$8E
0166      SS_MsSig:=$8A
016E      SS_MnSel:=$87
0176      SS_GIP:=$94
017E      SS_Mouse:=$89
0186      ss_sbar:=$88
018E      ss_wnset:=$86
0196      ss_umbar:=$95
019E      gs_opt:=$00
01A6      ss_ssig:=$1A
01AE      ss_rel:=$1B
01B6      ss_scsiz:=$26
01BE      gs_palt:=$91
01C6      gs_kysns:=$27
01CE      ss_styp:=$93
01D6      ss_fbrg:=$96
01DE      ss_mtyp:=$92
01E6      Follow:=1
01ED      MouseSig:=10
01F4
01F5      DIM EndStr:STRING[1]
0201      DIM Null,CallCode,FunCode:BYTE
0210      Null:=0
0217      EndStr:=CHR$(Null)
0220      StdOut:=1 \StdIn:=0
022F
0230      (* End definitions
0242
0243
0244
0245      IF LEFT$(action,1)="_" THEN GOSUB 10000
0258        ON act GOSUB 1000,2000,3000,4000,5000,6Q00,7000,8000,9000
0284        END
0286      ENDIF
0288
0289      IF action="ss.sbar" THEN act:=100
02A3      ELSE IF action="ss.wnset" THEN act:=200
02C1        ELSE IF action="ss.umbar" THEN act:=300
02E0          ELSE IF action="ss.mnsel" THEN act:=400
02FF            ELSE IF action="ss.msig" THEN act:=500
031D              ELSE IF action="ss.mous" THEN act:=600
033B                ELSE IF action="gs.mous" THEN act:=700
0359                  ELSE IF action="ss.gip" THEN act:=800
0376                    ENDIF
0378                  ENDIF
037A                ENDIF
037C              ENDIF
037E            ENDIF
```

```
0380          ENDIF
0382        ENDIF
0384      ENDIF
0386
0387      ON act GOSUB 100,200,300,400,500,600,700,800
03AF      END
03B1
03B2 100  CallCode:=I_SetStt
03BD      Regs.a:=path
03C9      Regs.b:=ss_sbar
03D5      Regs.x:=one \(* contains horiz position
03FB      Regs.y:=two \(* contains vertical postion
0423      RETURN
0425
0426 200  CallCode:=I_SetStt \(* Set Status Code
0443      Regs.a:=path
044F      Regs.b:=ss_wnset
045B      Regs.x:=one \(* address of window structure
0485      Regs.y:=two \(* window type code
04A4      RUN SysCall(CallCode,Regs)
04B3      RETURN
04B5
04B6 300  CallCode:=I_SetStt \(* Set Status Code
04D3      Regs.a:=path
04DF      Regs.b:=ss_umbar
04EB      RETURN
04ED
04EE 400  Regs.a:=path
04FD      Regs.b:=SS_MnSel
0509      CallCode:=I_Getstt
0511      RUN SysCall(CallCode,Regs)
0520      one:=Regs.a \(* contains Menu ID Number
0545      two:=Regs.b \(* contains Menu Item Number
056C      RETURN
056E
056F 500  Regs.a:=path
057E      Regs.b:=SS_MsSig
058A      Regs.x:=one \(* contains requested signal code
05B7      CallCode:=I_SetStt
05BF      RUN SysCall(CallCode,Regs)
05CE      RETURN
05D0
05D1 600  Regs.a:=path
05E0      Regs.b:=SS_Mouse
05EC      Regs.x:=one \(* Update / timeout info
0610      Regs.y:=two \(* Follow=1, NoFollow=0
0633      CallCode:=I_SetStt
063B      RUN SysCall(CallCode,Regs)
064A      RETURN
064C
064D 700  Regs.a:=path
065C      Regs.b:=SS_Mouse
0668      Regs.x:=one \(* address of mouse packet
068E      CallCode:=I_Getstt
0696      RUN SysCall(CallCode,Regs)
06A5      one:=Regs.x \(* address of mouse packet
06CA      RETURN
06CC
06CD 800  Regs.a:=path
06DC      Regs.b:=SS_GIP
06E8      Regs.x:=one \(* Resolution, Port Location
0710      Regs.y:=two \(* Repeat start, repeat delay
0739      CallCode:=I_SetStt
0741      RUN SysCall(CallCode,Regs)
0750      RETURN
0752
0753 1000 CallCode:=I_Getstt
075E      Regs.a:=path
076A      Regs.b:=gs_opt
0776      Regs.x:=one \(* packet address of options
079E      RUN SysCall(CallCode,Regs)
07AD      RETURN
07AF
07B0 2000 CallCode:=I_SetStt
07BB      Regs.a:=path
```

Submitting Material To Rainbow

Contributions to THE RAINBOW are welcome from everyone. We like to run a variety of programs that are useful/helpful/fun for other CoCo owners.

WHAT TO WRITE: We are interested in what you may wish to tell our readers. We accept for consideration anything that is well-written and has a practical application for the Tandy Color Computer. If it interests you, it will probably interest lots of others. However, we vastly prefer articles with accompanying programs which can be entered and run. The more unique the idea, the more the appeal. We have a continuing need for short articles with short listings. These are especially appealing to our many beginners.

FORMAT: Program submissions must be on tape or disk, and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs and debug our typing errors. All programs should be supported by some editorial commentary explaining how the program works. We also prefer that editorial copy be included on the tape or disk using any of the word processors currently available for the Color Computer. Also, please include a double-spaced printout of your editorial material and program listing. Do not send text in all capital letters; use upper- and lowercase.

COMPENSATION: We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a self-addressed, stamped envelope (SASE) to: Submission Guidelines, THE RAINBOW, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. We will send you comprehensive guidelines.

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```
07C7       Regs.b:=ss_ssig
07D3       Regs.x:=one \(* contains requested signal code
0800       RUN SysCall(CallCode,Regs)
080F       RETURN
0811
0812 3000  CallCode:=I_SetStt
081D       Regs.a:=path
0829       Regs.b:=ss_rel
0835       RUN SysCall(CallCode,Regs)
0844       RETURN
0846
0847 4000  CallCode:=I_SetStt
0852       Regs.a:=path
085E       Regs.b:=ss_scsiz
086A       RUN SysCall(CallCode,Regs)
0879       one:=Regs.x \(* contains number of columns
08A1       two:=Regs.y \(* contains number of rows
08C6       RETURN
08C8
08C9 5000  CallCode:=I_Getstt
08D4       Regs.a:=path
08E0       Regs.b:=gs_palt
08EC       RUN SysCall(CallCode,Regs)
08FB       RETURN
08FD
08FE 6000  CallCode:=I_Getstt
0909       Regs.a:=path
0915       Regs.b:=gs_kysns
0921       RUN SysCall(CallCode,Regs)
0930       one:=Regs.a \(* contains keyboard scan info
0959       RETURN
095B
095C 7000  CallCode:=I_Getstt
0967       Regs.a:=path
0973       Regs.b:=ss_styp
097F       RUN SysCall(CallCode,Regs)
098E       one:=Regs.a \(* contains screen type code
09B5       RETURN
09B7
09B8 8000  CallCode:=I_Getstt
09C3       Regs.a:=path
09CF       Regs.b:=ss_fbrg
09DB       RUN SysCall(CallCode,Regs)
09EA       one:=Regs.a \(* contains foreground palette reg. no.
0A1C       two:=Regs.b \(* contains background palette reg. no.
0A4E       three:=Regs.x \(* least sig. byte of border palette no.
0A81       RETURN
0A83
0A84 9000  CallCode:=I_SetStt
0A8F       Regs.a:=path
0A9B       Regs.b:=ss_mtyp
0AA7       Regs.x:=one \(* contains monitor type
0ACB       RUN SysCall(CallCode,Regs)
0ADA       RETURN
0ADC
0ADD 10000 IF action="_gs_opt" THEN act:=1000
0AFB       ELSE IF action="_ss_ssig" THEN act:=2000
0B1A         ELSE IF action="_ss_rel" THEN act:=3000
0B38           ELSE IF action="_ss_scsiz" THEN act:=4000
0B58             ELSE IF action="_gs_palt" THEN act:=5000
0B77               ELSE IF action="_mgpb" THEN act:=6000
0B93                 ELSE IF action="_styp" THEN act:=7000
0BAF                   ELSE IF action="_fbrg" THEN act:=8000
0BCB                     ELSE IF action="_mtyp" THEN act:=9000
0BE7                       ENDIF
0BE9                     ENDIF
0BEB                   ENDIF
0BED                 ENDIF
0BEF               ENDIF
0BF1             ENDIF
0BF3           ENDIF
0BF5         ENDIF
0BF7       ENDIF
0BF9       RETURN
0BFB
```

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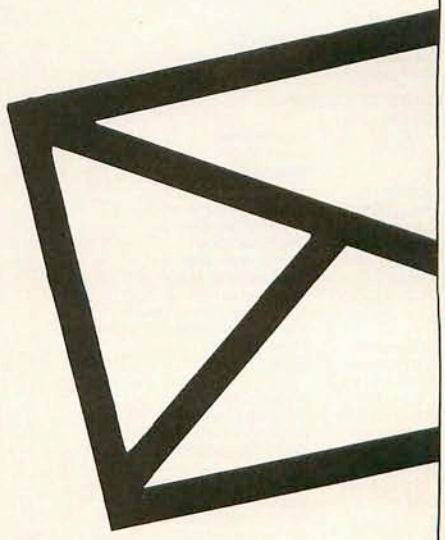

Racksellers

The retail stores listed below carry THE RAINBOW on a regular basis and may have other products of interest to Tandy Color Computer users. We suggest you patronize those in your area.

ALABAMA
- Birmingham — Jefferson News Co.
- Brewton — McDowell Electronics
- Florence — Anderson News Co.
- Greenville — M & B Electronics
- Madison — Madison Books
- Montgomery — Trade 'N' Books
- Tuscaloosa — Injun John's, Inc.

ALASKA
- Fairbanks — Arrow Appliance/Radio Shack; Electronic World

ARIZONA
- Cottonwood — A & W Graphics Co.
- Lake Havasu City — Book Nook
- Phoenix — TRI-TEK Computers
- Tempe — Books, Etc.; Computer Library
- Tucson — Anderson News Co.

ARKANSAS
- Fayetteville — Vaughn Electronics/Radio Shack
- Ft. Smith — Hot Off the Press Newsstand
- Little Rock — Anderson News Co.

CALIFORNIA
- Berkeley — Lyon Enterprises
- Citrus Heights — Software Plus
- Grass Valley — Advance Radio, Inc.
- Hollywood — Levity Distributors; Stef-Jen, Inc.
- La Jolla — Butler & Mayes Booksellers
- Los Angeles — Circus of Books (2 Locations)
- Marysville — Bookland
- Napa — Bookends Bookstore
- Oakland — DeLauer's News Agency
- Rancho Murieta — Software Plus
- Sacramento — Deibert's Readerama; Tower Magazine
- San Francisco — Booksmith; Bookworks; Castro Kiosk
- Santa Monica — Midnight Special Bookstore
- San Jose — Computer Literacy Bookshops
- Santa Rosa — Sawyer's News, Inc.
- Stockton — Harding Way News; Paperbacks Unlimited
- Sunnyvale — Computer Literacy
- Torrance — El Camino College Bookstore

COLORADO
- Aurora — Aurora Newsstand
- Colorado Springs — Hathaway's
- Denver — News Gallery
- Glenwood Springs — The Book Train
- Grand Junction — Readmore Book & Magazine
- Longmont — City Newsstand

DELAWARE
- Middletown — Delmar Co.
- Newark — Newark Newsstand
- Wilmington — Normar, Inc.—The Smoke Shop

DISTRICT OF COLUMBIA
- Washington, DC — Chronichles; News Room; World News, Inc.

FLORIDA
- Boca Raton — Great American Book Co.
- Clearwater — The Avid Reader
- Cocoa — The Open Door
- Dania — Dania News & Books
- Davie — Software Plus More
- Ft. Lauderdale — Bob's News & Book-Store; Clarks Out of Town News; Mike's Electronics Distributor
- Gainesville — Paper Chase
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- Titusville — Computrac

GEORGIA
- Atlanta — Border's
- Bremen — Bremen Electronics/Radio Shack
- Forest Park — Ellers News Center
- Jesup — Radio Shack
- Thomasville — Smokehouse Newsstand
- Toccoa — Martin Music Radio Shack

IDAHO
- Boise — Book Shelf, Inc.
- Moscow — Johnson News Agency

ILLINOIS
- Belleville — Software or Systems
- Champaign — Bookmark
- Chicago — B. Dalton Booksellers
- Decatur — Book Emporium; K-Mart Plaza; Northgate Mall
- East Moline — Book Emporium
- Evanston — Norris Center Bookstore
- Kewanee — Book Emporium
- Lisle — Book Nook
- Lombard — Empire Periodicals
- Newton — Bill's TV Radio Shack
- Paris — Book Emporium
- Peoria — Book Emporium; Sheridan Village; Westlake Shopping Center; Illinois News Service
- Springfield — Book Emporium; Sangamon Center North; Town & Country Shopping Ctr.
- Sunnyland — Book Emporium
- West Frankfort — Paper Place
- Wheeling — North Shore Distributors

INDIANA
- Angola — D & D Electronics; Radio Shack
- Berne — White Cottage Electronics
- Bloomington — Book Corner
- Columbus — Micro Computer Systems, Inc.
- Crawfordsville — Koch's Books
- Dyer — Miles Books
- Franklin — Gallery Book Shop
- Ft. Wayne — Michiana News Service
- Garrett — Finn News Agency, Inc.
- Indianapolis — Bookland, Inc.; Borders Bookshop; Delmar News; Indiana News; Southside News
- Lebanon — Gallery Book Shop
- Martinsville — Radio Shack
- Richmond — Voyles News Agency, Inc.
- Wabash — Mitting's Electronics

IOWA
- Davenport — Interstate Book Store
- Des Moines — Thackery's Books, Inc.
- Fairfield — Kramers Books & Gifts

KANSAS
- Hutchinson — Crossroads, Inc.
- Topeka — Palmer News, Inc.; Town Crier of Topeka, Inc.
- Wellington — Dandy's/Radio Shack Dealer
- Wichita — Lloyd's Radio

KENTUCKY
- Hazard — Daniel Boone Gulf Mart
- Henderson — Matt's News & Gifts
- Hopkinsville — Hobby Shop
- Louisville — Hawley-Cooke Booksellers (2 Locations)
- Middletown — Software City
- Paducah — Radio Shack

LOUISIANA
- Baton Rouge — City News Stand
- Lockport — TV Doctor/Radio Shack
- New Orleans — Sidney's News Stand Uptown
- Monroe — The Book Rack

MAINE
- Bangor — Magazines, Inc.
- Brockton — Voyager Bookstore
- Caribou — Radio Shack
- Oxford — Books-N-Things
- Sanford — Radio Shack

MARYLAND
- College Park — University Bookstore

MASSACHUSETTS
- Boston — Eastern Newsstand
- Brockton — Voyager Bookstore
- Cambridge — Out Of Town News

MASSACHUSETTS (cont'd)
- Ipswich — Ipswich News
- Littleton — Computer Plus
- Lynn — North Shore News Co.
- Swansea — Newsbreak, Inc.

MICHIGAN
- Allen Park — Book Nook, Inc.
- Birmingham — Border's Book Shop
- Durand — Robbins Electronics
- E. Detroit — Merit Book Center
- Harrison — Harrison Radio Shack
- Hillsdale — Electronics Express/Radio Shack
- Holland — Fris News Company
- Lowell — Lowell Electronics
- Muskegon — The Eight Bit Corner
- Niles — Michiana News Service
- Perry — Perry Computers
- Riverview — Riverview Book Store
- Roseville — New Horizons Book Shop

MINNESOTA
- Burnsville — Shinder's Burnsville
- Crystal — Shinder's Crystal Gallery
- Edina — Shinder's Leisure Lane
- Minneapolis — Shinder's (2 Locations)
- Minnetonka — Shinder's Ridge Square
- Roseville — Shinder's Roseville
- St. Paul — Shinder's Annex; Shinder's Maplewood; Shinder's St. Pauls
- Willmar — The Photo Shop

MISSOURI
- Farmington — Ray's TV & Radio Shack
- Flat River — Ray's TV & Radio Shack
- Florissant — Book Brokers Unlimited
- Jefferson City — Cowley Distributing
- Kirksville — T&R Electronics
- St. Louis — Book Emporium
- St. Robert — Bailey's TV & Radio

MONTANA
- Butte — Plaza Books

NEBRASKA
- Lincoln — Nebraska Bookstore
- Omaha — Nelson News

NEVADA
- Carson City — Bookcellar
- Las Vegas — Hurley Electronics; Steve's Books & Magazines

NEW HAMPSHIRE
- Keene — Radio Shack Associate Store
- Manchester — Bookwrights
- West Lebanon — Verham News Corp.

NEW JERSEY
- Atlantic City — Atlantic City News Agency
- Cedar Knolls — Village Computer & Software
- Clinton — Micro World II
- Pennsville — Dave's Elect. Radio Shack
- Rockaway — Software Station

NEW MEXICO
- Alamogordo — New Horizons Computer Systems
- Albuquerque — Page One Newsstand
- Santa Fe — Downtown Subscription

NEW YORK
- Amherst — Village Green-Buffalo Books
- Brockport — Lift Bridge Book Shop, Inc.
- Brooklyn — Cromland, Inc.
- Elmira Heights — Southern Tier News Co., Inc.
- Fredonia — On Line: Computer Access Center
- Hudson Falls — G.A. West & Co.
- Huntington — Oscar's Bookshop
- Johnson City — Unicorn Electronics
- New York — Barnes & Noble—Sales Annex; Coliseum Books; Eastern Newsstand; Grand Central Station, Track 37; 200 Park Ave., (Pan Am #1); 55 Water Street; World Trade Center #2; First Stop News; Idle Hours Bookstore; International Smoke Shop; Jonil Smoke; Penn Book; Software City; State News; Walden Books; World Wide Media Services
- Pawling — Universal Computer Service
- Rochester — Village Green; World Wide News

NORTH CAROLINA

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Chapel Hill	University News & Sundry
Charlotte	Newsstand Int'l
Hickory	C² Books & Comics
Jacksonville	Michele's, Inc.
Kernersville	K & S Newsstand
Marion	Boomers Rhythm Center
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Chardon	Thrasher Radio & TV
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Cleveland	Erieview News
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Taklequah	Thomas Sales, Inc. dba Radio Shack
Tulsa	Steve's Book Store

OREGON

Eugene	Libra Books — Book Mark
Portland	Fifth Avenue News
	Rich Cigar Store, Inc.
	Sixth & Washington News
Salem	Capitol News Center
	Checkmate Book

PENNSYLVANIA

Allentown	Owl Services
Altoona	Newborn Enterprises
Bryn Mawr	Bryn Mawr News
Corry	Corry Books & Cards
Danville	McIndoe's Stationery & Radio Shack
Feasterville	Global Books
King of Prussia	Gene's Books
Malvern	Personal Software
Reading	Smith's News & Card Center
Temple	Software Corner
West Chester	Chester County Book Co.
Wind Gap	Micro World
York	The Computer Center of York
	Tollgate Bookstore

RHODE ISLAND

Newport	Bellevue News

SOUTH CAROLINA

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Clemson	Clemson Newsstand
Florence	Ray's #1
Greenville	Palmetto News Co.
Spartanburg	Software City

TENNESSEE

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Chattanooga	Anderson News Co.
	Guild Books & Periodicals
Dickson	Highland Electronics
Knoxville	Anderson News Co.
	Davis-Kidd Bookseller
Memphis	Computer Center
Nashville	Davis-Kidd Booksellers
	Mosko's Place
	R.M. Mills Bookstore
Smyrna	Delker Electronics

TEXAS

Big Spring	Poncho's News
Desoto	Maxwell Books
Elgin	The Homing Pigeon
Harlington	Book Mark

UTAH

Provo	Valley Book Center

VIRGINIA

Danville	K & S Newsstand
Hampton	Benders
Norfolk	I-O Computers
	Turn The Page
Richmond	Volume I Bookstore

WASHINGTON

Port Angeles	Port Book & News
Seattle	Adams News Co., Inc.
	Bulldog News
Tacoma	B & I Magazines & Books
	Nybbles 'N Bytes

WEST VIRGINIA

Huntington	Nick's News
Logan	Stan's Electronics & Radio Shack
Madison	Communications, LTD
Parkersburg	Valley News Service
South Charleston	Spring Hill News

WISCONSIN

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Cudahy	Cudahy News & Hobby
Kenosha	R.K. News, Inc.
Madison	Pic A Book
	University Bookstore
Milwaukee	Juneau Village Reader
Waukesha	Holt Variety

ARGENTINA

Cordoba	Information Telecommunicationes

AUSTRALIA

Blaxland	Blaxland Computers
Kingsford	Paris Radio Electronics

CANADA:

ALBERTA

Banff	Banff Radio Shack
Bonnyville	Paul Tercier
Brooks	Double "D" A.S.C. Radio Shack
Calgary	Billy's News
Claresholm	Radio Shack Associated Stores
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St. Paul	Walter's Electronics
Stettler	Stettler Radio Shack
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Taber	Pynewood Sight & Sound
Westlock	Westlock Stereo
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Burns Lake	VT. Video Works
Campbell River	TRS Electronics
Chilliwack	Charles Parker

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Kelowna	Telesoft Marketing
Langley	Langley Radio Shack
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New Westminster	Cody Books LTD
Parksville	Parksville TV
Penticton	D.J.'s
	Four Corner Grocery
Sidney	Sidney Electronics
Smithers	Wall's Home Furniture
Squamish	Kotyk Electronics
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	Friendlyware Computers
	Granville Book Co.
	Siliconnections Books LTD
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Selkirk	G.L. Enns Elec.
Virden	Archer Enterprises
Winnipeg	J & J Electronics Ltd.

NEW BRUNSWICK

Moncton	Jeffries Enterprises
Sussex	Dewitt Elec.

NEWFOUNDLAND

Botwood	Seaport Elec.
Carbonear	Slade Realties

NOVA SCOTIA

Halifax	Atlantic News

ONTARIO

Angus	Micro Computer Services
Aurora	Compu Vision
Concord	Ingram Software
Exceter	J. Macleane & Sons
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Huntsville	Huntsville Elec.
Kenora	Donny "B"
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South River	Max TV
	Dennis TV
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Estevan	Kotyk Electronics
Moose Jaw	D&S Computer Place
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Regina	Regina CoCo Club
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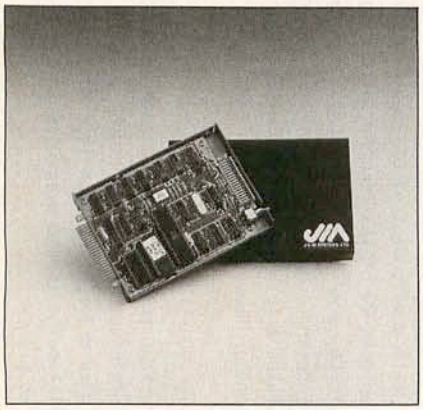

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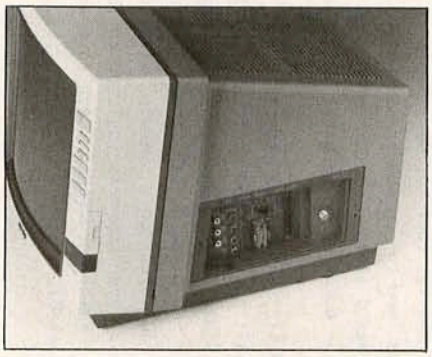

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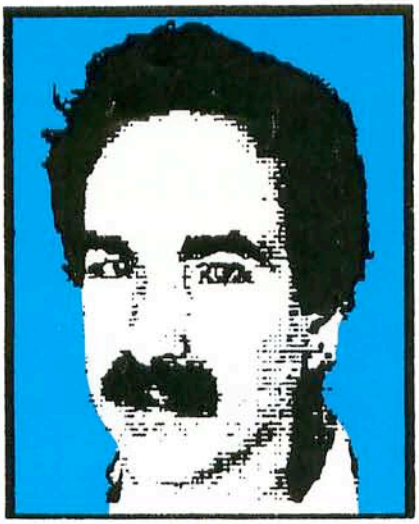

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